THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

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STUDIES ON THE MECHANICAL TRANSMISSION OF STRAWBERRY YELLOWS[1]

P. W. Miller

A large number of virus diseases attacking rosaceous plants have been described, but thus far the causal viruses of few of these have been transmitted mechanically other than by grafting. Most of the past attempts at transmission have been made by macerating infected leaves in a mortar with a pestle and using only the extracted juice as an inoculum. The works of Best and Samuel (1), Best (2), and others have shown that the addition of certain materials to extracted leaf juice of certain viruliferous plants increases infectivity appreciably.

Since a mechanical method of transfer of strawberry viruses would greatly expedite experimental studies, it was deemed advisable to determine whether they could be transmitted mechanically if certain of the materials used by other workers were added to the extracted juice of affected plants. Accordingly, several young leaves from Marshall plants infected with yellows were macerated in a mortar, and the juice was pressed out with a pestle. A volume equal to the volumes of juice of water solutions of the chemicals listed in Table 1 was added immediately after pressing. This was used immediately as an inoculum.

The inoculations were made by sprinkling fine carborundum powder on the two youngest leaves of healthy young Fragaria vesca (East Malling strain) plants, adding a small quantity of the amended inoculum, and rubbing it gently into the epidermis with a flattened spatula.

The results of inoculations of healthy F. vesca plants are given in Table 1. Positive transmission of strawberry yellows was obtained on a small percentage of the plants when M/100 sodium sulfite was added to leaf juice extracted from infected plants. However, the percentage of positive transmission may be so small as to exclude this technique as a routine method of transmitting strawberry yellows.

Table 1. Results of studies on the mechanical transmission of strawberry yellows, Corvallis, Oregon, 1950.

Substances added to extracted leaf juice	Plants inoculated	Plants infected
	Number	Percent
None (check)	15	0
Sodium sulfite (M/100)	32	6.2
Ascorbic acid (M/100; adjusted to pH7)	21	0
Cysteine hydrochloride (M/100; adjusted to pH7)	30	0
Lead acetate (1%)	12	0
Gelatine (1%)	9	0
Gelatine (2%)	16	0
Charcoal (1% by weight)	7	0

The failure to transmit strawberry yellows mechanically with regularity is believed to be due not only to properties of the viruses but also to those of the host. In extracted leaf juice, the normal proteins as well as the virus are believed to be brought into contact with certain protein precipitants which are liberated during maceration of the leaves. These are probably present in such large quantities that after withdrawal of the leaf proteins, the aqueous extracts still contain sufficient amounts of the precipitants to precipitate all or practically all of the virus.

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1. Best, Rupert J. and Geoffrey Samuel. The effect of various chemical treatments on the activity of the viruses of tomato spotted wilt and tobacco mosaic. Ann. Appl. Biol. 23: 759-780. 1936.

[1]Cooperative project between the Division of Fruit and Vegetable Crops and Diseases, U. S. Department of Agriculture and the Oregon Agricultural Experiment Station; published with the approval of the Director of the Oregon Agricultural Experiment Station as Technical Paper No. 674. Contribution of the Department of Botany and Plant Pathology.

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NATURAL OCCURRENCE OF THE PHONY VIRUS IN WILD CHICKASAW PLUMS NEAR PEACH ORCHARDS IN GEORGIA

L. C. Cochran, J. H. Weinberger, and W. F. Turner

In the heavily phony-infected area of Georgia growers and control officials have called attention to the frequent initial occurrence of this virus disease in trees in young peach orchards adjacent to fence-row stands and thickets of chickasaw plum (Prunus angustifolia Marsh.). Hutchins and Rue [1] demonstrated natural infection of this plum. They investigated one thicket of plum seedlings adjacent to a commercial peach orchard showing a high incidence of phony and found upwards of one-third of the plums infected. This evidence indicated the importance of further investigation of the role of wild plums in the spread of the phony disease.

In July 1944, 137 chickasaw plum trees, growing adjacent to or near heavily phony-affected peach orchards or in locations from which affected orchards had been removed, were chosen on 11 sites located in Macon, Peach, Crawford, and Houston Counties in Georgia. The plum trees chosen were sufficiently far apart so that they were not connected by underground stolons and thus represented 137 individual plants. Records were made of the general character of the growth of each individual. Three roots of approximately 1/2 to 3/4 inch diameter were collected from each plum tree and shipped to Brownwood, Texas, where they were whip-grafted onto roots of growing peach trees. Examination of the grafts two years later, when the peach trees were observed for evidence of transmission, revealed successful union of the plum roots on only 64 of the 137 peach trees grafted. Some of the 73 peach trees on which no living grafts were found may have had sufficient initial union for a test, but the root-piece had died during the incubation period. This is evidenced by the fact that of the 17 cases of transmission obtained from the plums 7 were on trees bearing no living plum root-pieces at the time the readings were made. Adding the 7 to the 64 bearing living root-pieces gives a known test for 71 of the 137 plums from which roots were collected. No spread occurred to uninoculated control peach trees.

Of the 64 plum trees from which tests were successfully made as evidenced by living root-piece grafts, 10, or 15.6 percent, were carrying the phony virus. If tests can be assumed on the remainder of the 73 plums on which no living root-piece grafts were found and of which 7, or approximately 10 percent, transmitted, then 17, or 12.4 percent, of all the 137 plums under test were carrying the phony virus. This percentage may be slightly low for the plums tested, since a smaller percentage of successful grafts may have resulted with root-pieces from the phony-affected plum trees than with those from the uninfected plums.

No transmission was obtained from plum trees in some of the sites chosen, whereas 4 of the 15 in one site and 4 of 18 and 2 of 7 in others transmitted. Of the 15, 18, and 7 peach trees grafted from these source roots, only 6, 10, and 2, respectively, bore living root-piece grafts. Generally, the plums in these lots were from locations in fence-rows immediately adjacent to heavily-infected peach orchards or old orchard sites, where the chance of becoming infected by spread from peach was more favorable than from some of the thicket plums which gave a smaller percentage of transmission or none. Some of the plum trees in the higher transmission percentage groups were found to be sprouts on old stumps and thus may represent long periods of exposure to natural spread.

It was surprising that of the 17 cases of transmission only 9 of the plum source trees were recorded as phony or phony-suspect in appearance. The other 8 were recorded as healthy or nearly normal in character of growth. Conversely, of the 54 plum trees represented by living root-pieces on the peach test trees, but failing to transmit, 7 were recorded, on the basis of tree growth symptoms, as good phony suspects and 11 others were recorded as phony suspects, but with less pronounced symptoms. These data indicate that diagnosis of phony in chickasaw plum in fence-rows or thickets under variable soil and fertility levels is unreliable on the basis of appearance. Where separate trees of this plum are grown in the nursery row in good soil, phony-affected ones are usually dwarfed, more compact, and darker green in color than normal ones.

Discussion and Conclusion

These data indicate two important advances in the information concerning the role of the chickasaw plum in the spread of the phony disease among peaches:

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[1] Hutchins, Lee M., and J. L. Rue. Natural spread of the phony disease to apricot and plum. Phytopathology 39: 661-667. 1949.

(1) Wild plums adjacent to infected peach orchards are commonly naturally affected and probably serve as a hold-over reservoir from which new orchards may be infected.
(2) Plums growing in fence-rows or thickets under variable conditions of crowding, fertility level, and soil types, do not develop characteristic recognizable growth symptoms when infected with the phony virus.

Although it is conclusively shown that the chickasaw plum is a natural host of the phony virus, its role in the spread of the phony disease is believed to be important chiefly from the standpoint of a hold-over reservoir from which new orchards can become infected when planted adjacent to the infected plums. The buildup of the phony disease within a peach orchard, once the virus is introduced, has been shown to be dependent upon several other factors and can take place in the heavily infected area without the presence of infected plums. Infected plums are, of course, a menace which must be eliminated along with diseased peaches in any area before the disease can be controlled. The evidence has now reached the point where any phony control recommendation should include elimination of wild plums adjacent to and near peach orchards.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, AND DIVISION OF FRUIT INSECT INVESTIGATIONS, BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, U. S. DEPARTMENT OF AGRICULTURE, FORT VALLEY, GEORGIA

OCCURRENCE OF PHONY DISEASE IN WILD PLUM THICKETS DISTANT FROM PEACH ORCHARDS IN SPARTANBURG COUNTY, SOUTH CAROLINA

Glenn KenKnight, H. L. Bruer, and C. E. Shepard

Hutchins and Rue (3) demonstrated natural spread of the phony disease to Prunus spp., including P. angustifolia Marsh., the common wild plum of the southeastern States. Cochran et al. (1) found phony prevalent in certain thickets of wild plum in the commercial peach-growing area of central Georgia, where the annual incidence of phony is high. No previous investigation of the occurrence of phony in wild plum has been made in an area where the annual incidence of phony in peach is low.

Phony was known to occur in peach orchards of Spartanburg County, South Carolina, as early as 1930, but was of little economic importance. Although the peach tree population increased from about 1,200,000 to over 3,000,000 during the period 1939-1949, the annual incidence of phony on infested properties remained very low: 14 phony trees were found on 12 infested properties in 1939 and 221 phony trees on 108 infested properties in 1949 (4). Each year newly infested properties have constituted a considerable proportion of the total number of infested ones. In spite of the proximity of peach orchards in some districts, newly infested properties have frequently been one to four or even more miles from any previously infested peach orchard rather than adjacent to infested orchards. These circumstances seemed to indict wild plum as a source of infection.

The following experiment was designed to determine whether phony is present in wild plums in advance of peach culture. In April 1949, 18-inch peach seedlings from a nursery at Zebulon, Georgia, were planted on a property near Gramling (Spartanburg County), South Carolina, to be used as test trees. In July, 5 plum thickets southeast of Campobello, South Carolina and 17 thickets southeast of Spartanburg, were indexed by grafting pieces of plum root onto these peach seedlings. The thickets selected were more than a mile from any recorded phony infested peach orchard, extant or extinct. In each thicket 15 to 20 plum trees were selected at intervals of not less than 15 feet. In order to obtain a wide sampling of plum thickets with a limited number of test trees, a root section from each of several (usually 5) plum trees was grafted on each peach test tree, with no replication. The root pieces were longitudinal sections about an inch long with bark on both sides. The sections were inserted, one above another, in a slit made in the trunk of the test tree by driving a knife through the trunk 3 or 4 inches above the ground line. Root sections were selected of suitable size so that the root bark matched stem bark of the test tree on both sides. The trunks were taped and paraffined. The grafts were made July 13-14, 1949. Acid test readings were made on the peaches August 23-24, 1950, in the field, in most instances on cross-sections from several branches. The test solution used consisted of 1 part of muriatic acid to 4 parts of methyl alcohol. Dying and dead trees and limbs with dieback were omitted in acid testing and tabulation (Table 1). The method of reading the phony acid test was described by Hutchins (2).

Table 1. Results of acid testing peach seedlings used in indexing wild plums from thickets in Spartanburg County, South Carolina.

Plum lot no.	Test tree no.	Number plums indexed on each test tree	Ratio of branches giving positive reaction to number tested	Ratio of test trees giving positive reaction to number tested
1	2-2	4	0/3	
	2-3	3	0/5	0/2
2	2-19	5	0/4	
	2-21	6	0/3	0/3
	2-22	6	0/5	
3	2-25	5	3/3	
	2-27	5	2/2	2/2
4	2-12	5	0/4	
	2-13	5	0/4	
	2-14	4	0/3	0/4
	2-15	4	0/5	
5	2-7	5	0/5	
	2-8	5	0/5	

Table 1. (Continued)

Plum lot no.	Test tree no.	Number plums indexed on each test tree	Ratio of branches giving positive reaction to number tested	Ratio of test trees giving positive reaction to number tested
5 (cont.)	2-9	5	1/3	2/4
	2-10	5	1/5	
6	2-35	5	0/4	
	2-38	6	0/3	0/2
7	2-41	5	0/3	
	2-44	4	0/3	0/3
	2-45	4	0/2	
8	2-48	5	0/2	
	2-51	4	5/5	1/3
	2-52	4	0/4	
9	2-53	5	0/5	
	2-54	5	0/8	
	2-55	4	0/5	0/4
	2-57	4	0/2	
10	2-59	5	0/5	
	2-60	5	0/3	0/3
	2-61	5	0/2	
11	4-1	5	0/4	
	4-3	4	0/4	0/3
	4-4	4	0/2	
12	1-1	5	0/4	
	1-2	5	0/3	0/3
	1-3	5	0/3	
13	3-8	5	2/4	
	3-9	5	0/2 (Suckers)	
	3-10	5	4/4	3/4
	3-11	2	4/4	
14	2-63	5	0/4	0/4
	2-64	5	0/4	
	2-65	5	0/3	
	2-66	5	0/5	
15	3-14	5	0/4	
	3-15	5	0/1	
	3-17	5	0/2	0/4
	3-18	5	0/4	
16	4-6	4	0/3	
	4-7	3	0/3	
	4-8	4	0/2	0/4
	4-9	4	0/3	
17	3-1	5	0/6	
	3-2	5	0/3	0/3
	3-4	5	0/3	
18	1-16	5	0/4	
	1-17	5	0/2	
	1-23	5	0/7	0/4
	1-29	5	0/6	
19	3-29	4	0/1	
	3-32	3	0/4	0/2
20	1-13	5	0/2	
	1-15	5	0/5	0/2
21	3-22	5	0/4	
	3-23	5	0/2	0/2
22	1-7	5	0/5	
	1-8	5	0/5	0/2
Totals	67		22/244	8/67

Table 1. (Continued)

Plum lot no.	Test tree no.	Number plums indexed on each test tree	Ratio of branches giving positive reaction to number tested	Ratio of test trees giving positive reaction to number tested
CONTROLS	1-24	--	0/2	--
	1-30	--	0/3	--
	2-6	--	0/2	--
	2-11	--	0/1	--
	2-16	--	0/5	--
	2-17	--	0/3	--
	2-23	--	0/3	--
	2-24	--	0/3	--
	2-43	--	0/3	--
	2-49	--	0/2	--
	2-56	--	0/14	--
	2-58	--	0/2	--
	2-62	--	0/7	--
	2-67	--	0/3	--
	2-68	--	0/9	--
	2-69	--	0/4	--
	2-70	--	0/4	--
	3-5	--	0/3	--
	3-12	--	0/7	--
	3-16	--	0/4	--
	3-28	--	0/2	--
	3-34	--	0/3	--
	3-38	--	0/3	--
	3-39	--	0/3	--
	4-5	--	0/2	--
	4-10	--	0/3	--
	4-11	--	0/3	--
Totals	27	--	0/103	0/27

Eight of 67 test peach trees gave a positive phony reaction. All 27 control trees gave a negative reaction. The plum trees from which the phony test trees were inoculated came from four thickets, all in the vicinity of Walnut Grove Church and School, about ten miles southeast of Spartanburg, far from the commercial peach area, and all more than two miles from the nearest property on which phony has been found. The number of controls was small, but the peach orchards on the property on which they were grown also served as controls. No phony has ever been found in those orchards. These results indicate that phony is endemic or naturalized in wild plum (Prunus angustifolia) in Spartanburg County, South Carolina.

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3. _____, and J. L. Rue. Natural spread of phony disease to apricot and plum. Phytopath. 39: 661-667. 1949.
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SURVEY OF PHONY INCIDENCE IN WILD PRUNUS

H. L. Bruer, C. E. Shepard, and T. D. Persons

Some of the earlier research on phony disease showed the possibility of inducing the malady in species of Prunus other than peach by means of graft inoculations. [1] Perhaps the earliest record of natural infection in wild prunus was made by T. D. Persons [2] in 1936, when he reported obtaining positive chemical tests from wild plum roots in Newton County, Mississippi. Hutchins and Rue (3) in 1949 reported natural spread of phony disease to Prunus armeniaca, P. hortulana, P. mexicana, P. mume, and P. angustifolia. Observations made in connection with the work of the phony peach disease control project over a period of more than 15 years have, in repeated instances, afforded grounds for strong suspicion that infection in wild plum serves as a source from which the disease may spread into commercial peach orchards. However, until recently no practical means was known for making diagnosis on a large-scale survey basis in wild Prunus. Most, if not all, of the naturally infected wild Prunus species that occur in the southeastern United States where phony disease is of importance are either completely symptom less or, at most, exhibit indeterminate symptoms. A procedure of graft indexing to peach on a large scale presented difficulties in the time, labor, and number of index trees involved that were totally beyond the resources that could be brought to bear on the problem. Hutchins (1) had described in 1933 a technique for chemically testing roots for the presence of phony disease using acidulated methanol as a reagent, and it was known that positive reactions were secured at times when the test was applied to stem tissues. At the time of the development of this test, however, phony virus was believed to be restricted to the root system. Under these circumstances the widespread application of the chemical test was in itself impracticable because of the excessive time and labor required to secure an adequate number of root-piece samples. With the more recent discovery that phony virus also occurs in the top wood of affected plants (2, 4), the application of chemical tests to stems became a practical possibility. KenKnight [2], working with approach and scion graft-inoculated peach and plum nursery trees found stems on the infected trees to give clear-cut color reactions with the chemical laboratory test described by Hutchins. While no large scale experiments have been made to correlate positive chemical reaction in naturally infected plums with transmission, a satisfactory chemical test is taken as evidence that the reacting plum is infected with the phony virus. It is possible that, similarly to peach, some infected plums fail to give a positive reaction to the laboratory test in all parts of the stems.

In February 1950 a survey was begun of wild Prunus in the southeastern States using the technique of chemically testing stems. This survey is being carried out in connection with other work of the phony peach disease control project, and will be continued as time and opportunity permit. In these tests the number of twigs tested from any particular location is variable, and is dependent upon the size of the thicket being sampled and the amount of time available. It has been the usual practice to cut one twig from each shrub sampled. Many of the species of Prunus native to the southeastern States produce root suckers in abundance, and the determination of the number of individual clones is practically impossible.

P. angustifolia is the predominant species in the area that has been surveyed, and for that reason the greater number of twigs tested have been of that species. Other species occur in varying numbers. Adequate identification of the species involved in a test was not always possible. It is known, however, that positive reactions have been secured from P. angustifolia, P. injucunda, and P. umbellata. Up to the present time these tests have been made and material secured from 31 counties in Alabama, Georgia, Mississippi, and South Carolina. Positive reactions have been secured from at least one location in 23 of these counties. The following table summarizes the tests that have been made.

It will be noted that the percentage of twigs that gave a positive reaction has been calculated for each county. It is believed that this ratio of positive tests to total number of tests constitutes a rough measurement of the extent of infection in wild Prunus, particularly if the sampling has included a sufficient number of scions. Assuming the validity of this ratio as a measuring device for estimating the relative intensity of infection, the disease is apparently more prevalent in wild Prunus in those areas where records of orchard inspections demonstrate that there is higher incidence in peach. Apparently the factors that favor the rapid spread and development of the disease in one host are also favorable for its development in the alternative host. Results of this survey indicate a sufficient reservoir of inoculum in wild Prunus that its consideration

[1] Unpublished.
[2] Unpublished data.

State and County	Number of locations from which samples were tested	Number of locations from which positive reactions were obtained	Number of twigs tested	Number of twigs giving positive reactions	Percent of twigs giving positive reaction
ALABAMA:					
Chilton	31	17	473	97	20.5
Cullman	2	0	187	0	0.0
Escambia	1	1	11	1	9.1
Madison	7	0	251	0	0.0
Morgan	1	0	52	0	0.0
Total	42	18	974	98	10.0
GEORGIA:					
Bibb	1	1	50	14	28.0
Houston	28	20	566	99	17.5
Jefferson	1	1	20	1	5.0
Macon	7	7	237	46	19.4
Peach	4	3	21	5	23.8
Pike	5	4	242	24	9.9
Spaulding	6	3	125	3	2.4
Upson	6	3	122	8	6.6
Washington	10	7	235	15	6.4
Total	68	49	1618	215	13.3
MISSISSIPPI:					
Alcorn	6	0	153	0	0.0
Clarke	1	1	9	1	11.1
Coahoma	4	2	74	3	4.1
Lafayette	4	2	174	5	2.9
Lee	10	1	225	2	0.9
Monroe	8	1	147	7	4.8
Sunflower	4	1	85	1	1.2
Union	5	1	138	3	2.2
Washington	4	1	77	2	2.6
Total	46	10	1082	34	2.2
SOUTH CAROLINA:					
Chesterfield	1	0	17	0	0.0
Edgefield	5	4	88	35	39.8
Laurens	1	0	13	0	0.0
Lexington	2	0	31	0	0.0
Newberry	1	0	16	0	0.0
Orangeburg	3	1	30	1	3.3
Saluda	1	1	19	2	10.5
Spartanburg	14	2	228	11	4.8
Total	28	8	442	49	11.1
Grand Total	184	85	4116	386	9.4

in a program of control of phony disease is important.

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TRANSMISSION OF APRICOT RING POX TO PEACHES AND PLUMS[1]

Austin O. Simonds

Ring pox was first observed in Colorado in 1935 and was later described by Bodine and Kreutzer (1) who named it "ringspot". Since this name had been used earlier for another virus disease of peach (2), the term "ring pox" was suggested and used by Reeves (3).

Host range studies of apricot ring pox have not been extensive and very little is known regarding other possible hosts of this virus. Although this virus disease does not spread rapidly, there has been a slow increase in the number of diseased trees found in Colorado during the last several years.

In an effort to learn something of the host range of this disease, two sources of inoculum were used. These were naturally diseased trees of the Moorpark and Montgamet varieties of apricot. Although diseased trees of both varieties were found in orchards near Palisade, Colorado, in one orchard with both varieties the disease was spreading only to Moorpark trees.

As a means of transmitting the disease, two or three buds from ring-pox diseased Moorpark or Montgamet apricots were inserted into individual plum and peach trees on August 1, 1946. Reinoculations with buds from the same sources were made into many of these same trees again in 1947.

Lack of trees made it necessary to use only single apricot trees for index tests started in 1947 and 1948 to determine which varieties of peach and plum might be carriers. When no ring pox symptoms were evident on the index apricot test trees, they were reinoculated the following year from the same peach or plum trees. The results of these single tree tests are combined and so indicated in Table 1.

Table 1. Results of index test onto Moorpark apricots from previously inoculated plum and peach trees.

Source of inoculum	Total number inoculated trees	Number trees infected	Number trees not infected
PLUMS			
Yakima (1)	6	4[a]	2
Yakima (2)	5	0	5
Climax	5	5	0
Duarte-Satsuma hybrid (1)	6	6[a]	0
Duarte-Satsuma hybrid (2)	5	5	0
Big Mack	5	3	0[b]
Red Wing	5	2	0[b]
Omaha	4	4	0
Red Late Hardy	5	0	2[b]
Hungarian Prune	6	1[a]	3[b]
PEACHES			
Hale Haven	6	6[a]	0
J. H. Hale	6	4[a]	0[b]
Elberta	6	6[a]	0
Orange Cling	6	6[a]	0
Indian Blood Cling	5	4	0[b]
UNINOCULATED CHECKS			
Moorpark apricots	45	0	34[b]

[a] = One tree in each total was from the preliminary test of 1947 and 1948.
[b] = Unaccounted for numbers here were due to winter killed trees.

Apricot test trees of the Moorpark variety were set out in the spring of 1949. Some of them had been propagated on apricot roots, others on peach roots, and records were kept to determine any effect the root stocks might have on the virus disease. During the latter part of June 1949,

[1]Scientific Paper No. 355, Colorado Agricultural Experiment Station.

a second set of bud inoculations was made into five apricot index trees from each of the previously inoculated plums and peaches. Forty-five uninoculated trees were left in blocks of fives as checks. The results are recorded in Table 1.

All of the trees used in index tests started in 1947 or 1948 were acting as carriers in 1950. It is notable in the Table that Yakima plum 1 gave positive results as a host but Yakima number 2 was negative. The Yakima (2) tree was inoculated in 1946 and again in 1947 from a diseased Montgamet tree, while Yakima (1) was inoculated only during 1946 from a diseased Moorpark tree. The different source of inoculum may be the explanation of the results. However, the inoculations of the two Duarte-Satsuma hybrids were made in a manner similar to that of the two Yakimas and both were carriers of the virus.

Death of trees during the very dry winter of 1949 left only two of the five apricot index trees inoculated from Red Late Hardy plum alive for readings in June 1950 and both of these were healthy. This Red Late Hardy plum was inoculated in 1946 and again in 1947 from a diseased Montgamet host.

The test Hungarian Prune tree was inoculated in 1946 and again in 1947 from the diseased Montgamet apricots. The single apricot index tree inoculated first in 1947 was the only tree which gave positive data, and it showed only a few leaves having characteristic symptoms for the first time in 1950. This tree had the following record: The tree was planted in 1946 and was inoculated with two diseased buds in 1947. There were no symptoms of the disease in 1948 so it was reinoculated with three more buds during the 1948 season. Again no symptoms were evident in 1949, but they did appear in 1950. None of the five apricot index trees inoculated in 1949 from the Hungarian Prune showed transmission.

It was notable that in all cases where infection was not readily obtained as indicated by the back inoculation to apricots, the source of the original virus inoculum was from the Montgamet variety of apricot. However, in the case of the peaches, all five varieties gave positive evidence that they can act as carriers, though J. H. Hale and Elberta were inoculated from the Montgamet variety, while Hale Haven, Orange Cling, and Indian Blood Cling were inoculated from the Moorpark variety of apricot.

None of the peach or plum varieties inoculated with buds from ring-pox diseased apricot trees showed any evidence of carrying the virus. Of note also, was the more pronounced ring-pox leaf symptom expression on apricot trees propagated on peach roots as compared with those trees grown on apricot roots.

The Royal variety of apricot which did not show ring pox symptoms in its foliage was found to be a carrier of the virus. Buds from a disease-inoculated Royal apricot taken to Moorpark produced symptoms in four of five trees tested. The fifth tree was winter killed.

Transmission experiments have shown that the Moorpark, Montgamet, Jones, Early Horn, Chinese, Reece, and Oliver varieties of apricots express symptoms of the ring pox disease in Colorado. The Royal variety expresses no symptoms but can carry the virus.

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VIRUS DISEASES OF SWEET CHERRIES IN MONTANA IN 1950 [1]

M. M. Afanasiev and H. E. Morris

For a number of years surveys of viroses of sweet cherries were made in orchards located on the east and south shores of Flathead Lake in Montana. Particular attention was paid to determine if little cherry virosis of sweet cherries is present. This disease has been reported from practically all western states and from Canada, but at the present time has not been reported in Montana.

The majority of surveyed trees were Lambert and Bing, which are the main commercial varieties in Montana. A few cherry trees of pollenizing varieties such as Deacon, May Duke, Black Republican, Stark Golden, Lambert-pollenizers (unnamed variety purchased as a pollenizer for Lambert), and other varieties were also examined.

These surveys showed that the following virus diseases were found on sweet cherries in Montana: mottle leaf, ring-spot complex, rasp and twisted leaf. These viroses are present only in traces, with the exception of a rather high percentage of ring-spot complex on May Duke and Stark Golden.

A number of trees in several orchards showed symptoms similar to a virosis called Lambert mottle which was first described from Canada.[2] This disease was detected on a number of trees in one of the orchards several years ago. These trees rapidly declined in vigor and the grower pulled them in 1948. After that only traces of this disease were present in this orchard until the spring of 1950 when a large number of trees in this same area of the orchard showed exactly the same symptoms. It is known now that this disorder is present in some other orchards on the Lake. To establish the nature of this disease, buds from diseased trees were placed on several healthy trees in August 1950 and it is planned to conduct more tests during 1951.

Another type of disorder found in practically all varieties of cherries and which closely resembles symptoms of some type of virosis was blotchy mottling. The leaves show irregular blotching, although they are normal in size and in shape. The fruit was not affected and the yield was normal. The intensity of blotching usually varies from year to year. It is also planned to conduct transmission experiments with this disorder.

Among the bud and scion perpetuated diseases traces of crinkle and deep suture were found on several varieties of cherries.

No little cherry virosis has been found in sweet cherry orchards on the Lake. It is known now that this virosis is closely related to the western X disease of peaches and to the red leaf disease of choke-cherries. A limited survey was made during the summer of 1950 in the orchards and among native vegetation along the shores of Flathead Lake for the above-mentioned diseases of peaches and chokecherries.

Most of the peach trees found in the orchards showed considerable amounts of winter injury, but none of them showed symptoms of western X disease. Some chokecherries showed red leaves, but it is believed that this condition was due to drought and not to the disease.

MONTANA STATE COLLEGE AGRICULTURAL EXPERIMENT STATION, BOZEMAN

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[1] Contribution from Montana State College Agricultural Experiment Station Paper No. 245 Journal Series.

[2] Lott, T. B. "Lambert mottle", a transmissible disease of sweet cherries. Scientific Agriculture 25: 776-779, August, 1945.

WINTER INJURY TO SWEET CHERRIES IN MONTANA[1]

H. E. Morris and M. M. Afanasiev

Sweet cherry trees grown on Flathead Lake in Montana have suffered considerable winter injury for the last three years, and especially so during the winters 1948-49 and 1949-50.

During the winter of 1948-49, besides the usual winter injury in the form of sun scald, many trees showed longitudinal splits in the bark and wood of the trunk and scaffold limbs. In this case the bark did not loosen and peel off, which is usual for sun scald, but remained tightly attached to the wood. Apparently an expansion occurred in the wood and the bark split apart as a result. This type of winter injury can possibly be explained as follows: Late in the fall and early in the winter of 1948-49 there was a considerable amount of moisture in the orchard soils. Then later on came a very heavy snowfall on the still-unfrozen soil. After that the temperature dropped below zero when the trees were still full of sap and were still taking moisture from the unfrozen ground. It is believed that this low temperature and the abundance of moisture in the trees are responsible for the splits in the wood and bark. In spite of the long splits which occurred in the cherry trees, they apparently did not suffer a great deal from this damage. Many growers sealed the cracks in the trees with either asphalt paint or other preparations.

Winter injury during 1949-50 was very severe and manifested itself mainly in sun scald or in flower bud injuries. Both types of winter injuries to the trees could be found in all orchards, but the prevalent type of injury on the south end of the Lake was a sun-scald type, while on the north end it was of a flower-bud type. The latter injury resulted in the death of many buds, and a high percentage of blossoms which opened were sterile.

The sun-scald injury to the trees was evident mostly on the south and southwest sides of the trees. Although the symptoms of this injury were usually more noticeable in the upper limbs and branches, it is believed that the most serious damage occurred on the trunk or the scaffold limbs of the trees. This supposition was substantiated during the latter part of the summer when about 150 winter-injured trees were pulled in several orchards and examined. This examination showed that the most serious damage occurred on the trunks of the trees, approximately in an area of one to two feet above the ground on the south or southwest exposures. The dying of the upper branches was chiefly due to trunk or scaffold limb injuries. In general, there was no apparent injury to the roots. Some crown gall injury and some root-rot injury was found on several roots.

The flower-bud injury was prevalent on all branches of the trees without any regard to exposure, which indicates that this type of injury was apparently due to low temperatures and not to sun scald. Regular weather readings along the shores of Flathead Lake are taken at two U. S. Weather Bureau Stations. One of these stations is located at Polson, Montana, on the south end of the Lake, and the other along the east shore of the Lake, 12 miles south of Big Fork, Montana.

Comparison of averages, minimum and maximum temperatures, for both stations for November and December of 1949, and for January, February, and March of 1950 showed very little difference. However, when an analysis of daily minimum temperatures for January and February is made, the following differences become evident. Most of the below-zero temperatures for both stations occurred during January and the first part of February, 1950. The lowest temperature for Polson recorded was -30° F. on January 31, and on the same date for Big Fork was only -20° F. These temperatures and also similar differences in minimum temperature between these two stations recorded on certain days during January and February definitely show that minimum temperatures were considerably lower for Polson as compared to Big Fork. On the whole, considerably more serious winter injury to the trees occurred at the south end of the Lake than at the north end. The difference in minimum temperatures may be the reason for this situation.

The only possible explanation in regard to the difference in the predominant type of winter injury which occurred on the opposite ends of the Lake could be given as follows. During this winter the north end of the Lake very often had continuous foggy days, when the south end of the Lake very often had bright sunshine. It is quite natural that bright, sunny days and low temperatures during the night were quite conducive to the sun-scald type of winter injury which was so prevalent on the south end of the Lake.

Among the different varieties of sweet cherries surveyed, the Bing variety showed 62.3

[1]Contribution from Montana State College Agricultural Experiment Station, Paper No. 244, Journal Series.

percent of winter-injured trees, Deacon 59.3, Black Republican 40, Lambert-pollenizers 26.7, Lambert 21.6, May Duke 21.1, and Stark Golden 14.3 percent.

Some of the remaining pollenizing varieties of cherries (Black Republican, Waterhouse, Royal Ann, Black Tartarian, Centennial and Windsor) also showed a rather high percentage of winter injury but it is difficult to judge their susceptibility to winter injury because of the small number of trees involved in this survey.

Bing and Lambert are the two main commercial varieties of sweet cherries in Montana. Bing suffered considerably greater winter damage than Lambert. There was a fairly good crop of cherries on Lambert trees at the south end of the Lake and only a sprinkling of cherries on the north end. There was no crop on Bing trees on either end of the Lake.

Among all pollenizing varieties of sweet cherries, Stark Golden appears to have suffered the least winter injury. Several cases were noted where orchards with Stark Golden trees for pollenizers had a much better set of fruit than those with other varieties of pollenizing cherries.

The bloom in all cherry orchards on the north and south ends of the Lake was much more abundant than the final set of fruit. This indicates that, in addition to the severe flower-bud injury causing many sterile blossoms in Lambert, lack of pollen because of severe injury to flower buds on pollenizing trees was also a contributing factor for the light crop in 1950.

Some of the growers on the north end of the Lake resorted to bouquet-pollination by bringing bouquets from the south end of the Lake and placing them in their cherry trees. This type of bouquet pollination had only very limited effect. The set of the fruit in very close proximity of these bouquets was much better than elsewhere on the same tree, but even so there was generally a very light crop.

MONTANA STATE COLLEGE AGRICULTURAL EXPERIMENT STATION, BOZEMAN

SPOT ANTHRACNOSES KNOWN IN MARYLAND AND THEIR DISTRIBUTION BY COUNTIES[1]

R. A. Jehle, Anna E. Jenkins, and W. F. Jeffers [2]

The importance of spot anthracnoses[3] other than bramble, and grape anthracnose has been appreciated by Maryland plant pathologists only within recent years. It seems advisable on this occasion to present a resume of this group of diseases as now known to exist in the State.

The earliest record of spot anthracnoses in Maryland is contained in the first annual report of the Maryland State Horticultural Society in 1898. In that year Townsend (30), who was the first State plant pathologist, reported both bramble, and grape anthracnose as follows: "Bramble anthracnose attacks both the canes and the leaves . . . Much may be done to prevent the appearance of this disease by so planting and pruning the bushes that they may receive an abundance of air and light, and by burning all diseased plants." Grape anthracnose "attacks the young shoots and fruit. To control this pest all diseased parts should be collected and burned."

Table 1. Reports of bramble and grape anthracnose in Maryland in 1898-1950.

Anthracnose		Year	Reference		Remarks
Bramble	Grape		Author	Citation	
+	+	1898	Townsend	(30)	See quotation in text
+		1899	"	(31)	Bramble anthracnose in evidence throughout the State
+	+	1900	"	(32)	Both diseases again in evidence
+	+	1900	Johnson Townsend & Gould	(20)	Mentioned as diseases which are likely to occur and which should be controlled by spraying
+	+	1901, 1902, 1907-1910	Norton et al	(23-28)	Bramble anthracnose reported each year, except in 1910, severe in 1908, common in 1909; grape anthracnose not reported in 1909, and never reported as severe. Control measures given for both diseases in 1907 and 1910.
+		1914	Ballard	(2)	
+		1942	Jeffers & Woods	(4)	Symptoms described and illustrated and control measures given
+	+	1915-1917	Temple	Reports	
+	+	1921-1950	Temple, Jehle, Vierheller, Walker, Jeffers, and Woods	to Plant Disease Survey	For bramble anthracnose losses of from 1 to 12% reported; for grape anthracnoses, only a trace of the disease

[1]Scientific Article No. A 317 Contribution No. 2276 of the Maryland Agricultural Experiment Station (Department of Plant Pathology). Paper presented at the Eighth Annual Meeting of the Potomac Division, American Phytopathological Society, Beltsville, Maryland, February 27, 1951.

[2]For a critical reading of this paper before its presentation we are indebted to E. A. Walker, who has given special attention to the existence and distribution of Maryland plant diseases in general.

[3]The class of diseases caused by Elsinoë, of which the conidial stage is Sphaceloma (14).

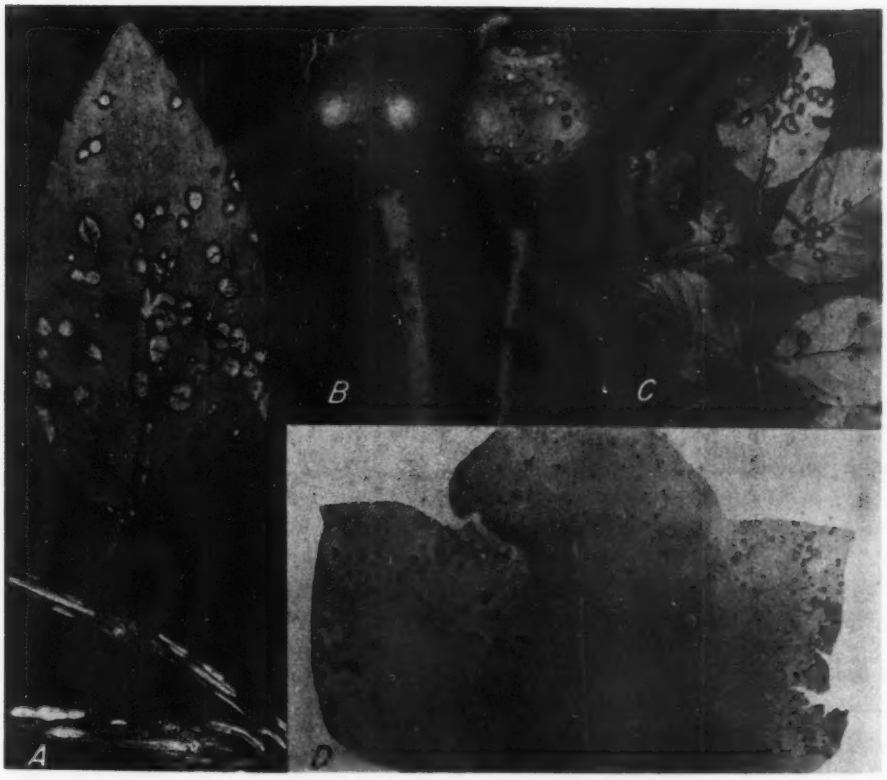

FIGURE 1, A, mint anthracnose on upper surface of leaves and on stems of Mentha piperita, Plant Industry Station, Beltsville, Maryland, July 31, 1950, X about 2. B and C, anthracnose on hips and pedicels (B) and on upper surface of leaflets (C) of Rosa multiflora, College Park, Maryland, Sept. 25, 1950, X 3. D, English ivy scab on lower leaf surface of Hedera helix, Salisbury, Maryland, July 14, 1950, X 1. Photographs by Jeffers.

These two diseases of small fruits have continued to be prevalent in Maryland, and appreciable losses from bramble anthracnose are recorded (Table 1).

Two other early records of spot anthracnoses from Maryland now available are those of plantain scab (1891) (see Jenkins and Bitancourt 16 p. 225) and violet scab (1897-99) (see Jenkins (13). Six other diseases of the group found in the State more or less recently are rose anthracnose (11, p. 321 and pl. 1), snowberry anthracnose (21, p. 393), Hercules club anthracnose (12), flowering dogwood spot anthracnose (17), mint anthracnose (33) (Fig. 1, A), and snowball anthracnose (18). The report of snowberry anthracnose cited above refers to an observation of the disease in Garrett County. According to an unpublished notation by J. B. S. Norton, apparently the same disease was abundant in 1930 on plantings of this shrub on the campus of the University of Maryland, College Park (Prince Georges County).

As reported upon at these meetings, special surveys for violet scab (34), plantain scab (9), and flowering dogwood spot anthracnose (7, 8) have revealed the wide distribution and prevalence in the State of the first two diseases named. It will be recalled that in one instance a destructive disease of pansy seedlings proved to be violet scab (6). Spot anthracnose of dogwood is prevalent in southern and southeastern Maryland. Based on present surveys, it practically disappears in the latitude of the 39th parallel.

New records of spot anthracnoses are listed in Table 2. These afford the first discovery of violet scab in the westernmost county of the State (Garrett County); at Oakland, it was found

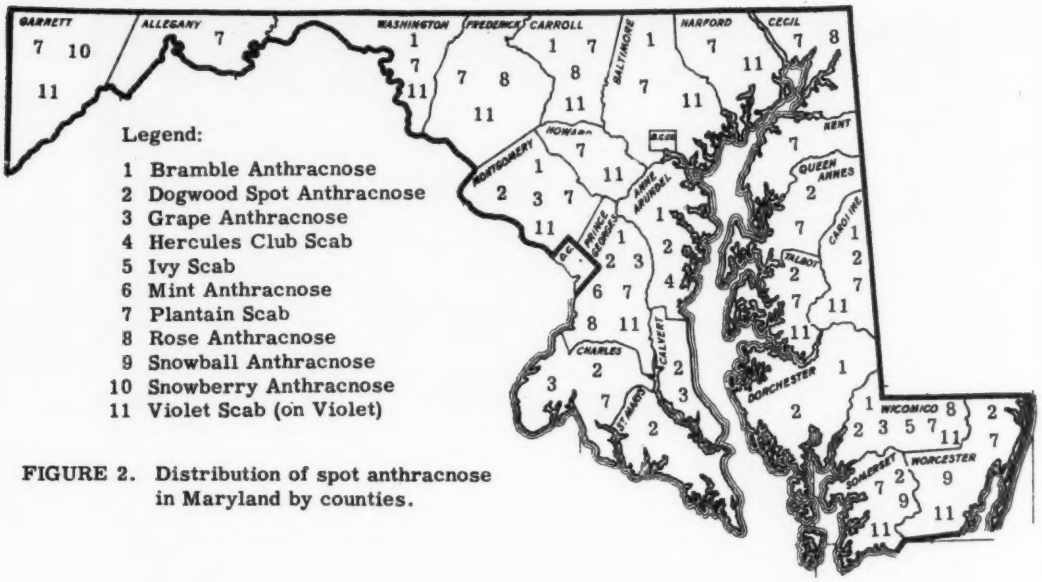

FIGURE 2. Distribution of spot anthracnose in Maryland by counties.

Table 2. Previously unreported records of spot anthracnose in Maryland.

Name of Disease	County	Town or locality	Date of collection [a]
Violet scab			
On wild violet (Viola spp.)	Baltimore City	J. M. Lowry Garden	Sept. 13, 1947
	Baltimore	Owings Mills	July 30, 1948
	Garrett	Oakland	June 25, 1948
		Underwood	June 24 and July 8, 1948
Plantain scab			
On Plantago rugelii	Alleghany	Route 40, near Washington County line	Aug. 18, 1947
		Klondike	Sept. 22, 1947
		Midland	Sept. 22, 1947
		Eckhart Mines	Sept. 22, 1947
	Cecil	Elk Neck	Sept. 21, 1947
	Charles	Indian Head	Oct. 4, 1949
	Howard	vic. Fulton	July 1, 1947
	Montgomery	Colesville	Sept. 30, 1947
		Wheaton	Sept. 30, 1947
On Plantago lanceolata	Talbot	vic. Trappe	June 14, 1948
Rose anthracnose			
On Rosa spp.	Prince Georges	Hyattsville	Aug. 10, 1947
		College Park [b]	Sept. 25, 1950
	Wicomico	Salisbury	Aug. 5, 1947
English ivy scab	Wicomico	Salisbury	Sept. 22, 1949
			Mar.-July, 1950

[a] Collector in all cases R. A. Jehle
[b] On Rose multiflora

Table 3. Chronological synopsis of spot anthracnoses known in Maryland.

Earliest record	Disease	Suscept (Scientific name)	Pathogen: Species of Elsinoë or Spaceloma	Pathogen: Original description or new combination in:	Source of earliest record in the State
1891	Plaintain scab	Plantago spp.	S. plantaginis Jenkins & Bitanc.	(16, p. 225)	Specimen collected by Erwin F. Smith (see 16, p. 225)
1898	Bramble anthracnose	Rubus spp.	E. veneta (Burkh.) Jenkins	(10, p. 696)	Townsend (30)
1898	Grape anthracnose	Vitis sp.	E. ampelina (DBy) Shear	(29, p. 677)	Townsend (30)
1897-99	Violet scab	Viola odorata	S. violae Jenkins	(22, p. 7)	Specimen as documented by Jenkins (13)
1925	Rose anthracnose	Rosa spp.	S. rosarum (Pass.) Jenkins	(11, p. 330)	Jenkins 11, p. 321 and pl. 1
1927	Snowberry anthracnose	Symphoricarpos albus var. laevigatus	S. symphoricarpi Barrus & Horsfall	(3, p. 799)	Specimen collected by Jenkins (21, p. 393)
1934	Hercules club scab	Aralia spinosa	S. araliae Jenkins	(12, p. 412)	Type specimen
1946	Flowering dogwood spot anthracnose	Cornus florida	E. corni Jenkins & Bitanc.	(17, p. 362)	Specimen collected by Bitancourt
1948	Mint anthracnose	Mentha spp.	S. menthae Jenkins	(12, p. 414)	Specimens collected by Thomas & Jenkins
1949	English ivy scab	Hedera helix	S. hederae Bitanc. & Jenkins	(15, p. 420)	Specimens collected by Jehle
1950	Snowball anthracnose	Viburnum opulus var. roseum	S. viburni Jenkins & Bitanc.	(15, p. 420)	Specimen collected by Jehle

on violets growing spontaneously in a lawn, and, at Underwood, on the border of a farm lane. At College Park, rose anthracnose was attacking Rosa multiflora[4] planted as a hedge on the University campus (Fig. 1, B and C). R. multiflora had been listed previously among numerous rose species subject to attack by rose anthracnose (11, p. 323), as well as stem cankers on this species chosen for illustration (19, color plate, F). The senior writer's personal observation of English ivy scab in California (5) facilitated his recognition evidently of this same disease in Maryland (Fig. 1, D).

For convenience of reference we have prepared a synoptic table (Table 3) of the spot anthracnoses known at present in Maryland, together with a map showing their location by counties (Fig. 2). The map is based on available specimens and in a few instances (rose anthracnose in Frederick County, bramble anthracnose in Anne Arundel, Baltimore, Carroll, and Caroline Counties, and grape anthracnoses in Carroll and Cecil Counties) on reports to the Plant Disease Survey. Specimens from Maryland represented as numbers in the Jenkins-Bitancourt "Myriangiales selecti exsiccati" are as follows: Elsinoë corni (Nos. 408, 460-462), S. plantaginis (Nos. 254, 255, 431-434), S. rosarum (No. 436), S. symphoricarpi (No. 271), E. veneta (No. 438), and S. violae (Nos. 168-170, 183, 189, 201, 202, 441-446, 449-450). A representative set of photographs of the several diseases has been made. In many cases these include kodachromes.

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[4]This is, of course, the rose species at present widely advocated for "living fences and wild life cover" (1).

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OBSERVATIONS ON RESISTANCE TO BLACK ROT IN CABBAGE [1]

Douglas C. Bain

Cursory observations of varieties of cabbage grown in the Crystal Springs area of Mississippi have indicated possibly a low degree of field resistance to black rot. Although a thorough search through the literature has not been made there are at least two references which indicate there is field resistance in cabbage to this disease. Heald (1), on page 340, stated that "The Houser cabbage has been reported as 'practically immune to black rot under field conditions', ...". Thung (2), while working in Java, reported that of several varieties tested, Late Giant, Early Drumhead, Sugar Loaf and Yellows Resistant showed more field resistance to black rot than Earliest of All and Yates Utility. Glory of Enkhuizen and 16 other varieties (not named in the abstract) were very susceptible. Since black rot occurs commonly every year in our area, and at times has been a limiting factor in production of marketable heads, it was considered desirable to explore the possibility of resistance in commercial varieties of cabbage. This paper presents results obtained by inoculating seed of different varieties and getting readings of black-rot while plants were in the cotyledonary stage. The selection of apparently disease-free plants from these tests is also discussed.

METHODS

Instead of spraying plants with inoculum, seed were soaked in a liquid culture of Phytomonas (Xanthomonas) campestris. Although this method might be considered unconventional, there were reasons for its development and use. Two grams of seed were soaked 24 hours in 5 ml. of a 6-10-day old liquid culture of inoculum in test tubes. Care was taken to shake the tubes occasionally. The seed and liquid were then poured out on two layers of filter paper in Petri dishes. The dishes were covered and kept at 70° to 80° F. until the seed showed signs of germinating -- usually two to five days, dependent upon variety. If more moisture was needed during this period, 2 to 3 ml. of the culture were added. When germination was evident, the filter paper with seed was lifted out of the plates, placed on fumigated soil in 4-inch pots and then covered with a standard amount of soil. The pots were covered with flats until emergence and then moved into the greenhouse. Temperature in the greenhouse was not constant but varied from 65° to 100° F. Two grams of seed of each variety were used in each of the series of tests. Symptoms of black rot on cotyledons were obvious in some susceptible varieties eight to ten days after plating the seed.

This method of inoculation, or subjecting seed to inoculum, permitted (1) the use of a large number of plants with a minimum of space (roughly 550 plants per 4-inch pot), (2) subjected plants to inoculum at the very earliest stage of development, (3) did away with much time and trouble of arranging suitable conditions for the period of incubation, and (4) subjected each potential plant to the same amount of inoculum.

RESULTS

Readings of varieties in each series were made at one time, 10 to 20 days after plating the seed; the ratings, therefore, apply only to plants under three weeks of age growing in pots under greenhouse conditions. Ratings as to resistance or susceptibility were made only on the general appearance of the cotyledons of all plants in the individual pots -- i.e., if practically all of the cotyledons in one pot were green that variety was considered resistant but if a few or all of the cotyledons showed necrosis the variety was considered susceptible.

Data presented in Table 1 give ratings of varieties of cabbage and cauliflower used in one or more series of tests made at different times. Six varieties of cabbage were consistently rated as resistant in three or more tests -- Premium Late Flat Dutch (A), Succession (F), Red Acre (A), Marion Market (L), Wisconsin Ballhead (L), and Early Round Dutch (A3). Since seed of the latter had been treated with Spergon, the resistant rating possibly should not be considered, although the plants later developed symptoms of black rot. Twenty-one varieties or strains were rated as susceptible; some of these were the same noted above but were of a different strain or seed source. A number were rated both susceptible and resistant. In certain varieties where there was no germination, it is conceivable that the seeds were rotted by P. campestris before they could germinate; however, there were no controls to check this.

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[1] Journal article No. 252, Mississippi Agricultural Experiment Station.

Table 1. Ratings as to resistance (R) and susceptibility (S) of different varieties and seed sources of cabbage and cauliflower to black rot. Plants three weeks or less in age.

Variety No.	Variety	Seed source[a]	Series ratings						
			C	E	F	G	H	J	K
(1)	Premium Late Flat Dutch	(A)	R	R	-	R	R?	R	R
(19)	do	(F)	-	R	S	S	S	S	S
(2)	Savoy Perfection Drumhead	(A)	R	-	-	-	-	-	-
(71)	do	(A2)	-	R	-	S	-	S?	S
(3)	Steins Early Flat Dutch	(A)	S	S	-	S	-	S	S
(4)	Succession	(A)	-	R	-	R?	-	S	S?
(26)	do	(F)	-	R	-	R?	-	R	R?
(5)	Wisconsin All Seasons	(A)	HR	-	-	-	-	R	-
(24)	do	(F)	-	R?	-	S	R	S	S
(54)	do	(L)	VS	S	-	S	-	S	S
(6A)	Early Round Dutch	(A)	-	-	-	-	-	R?	-
(72)	do	(A3)	-	R	-	R?	-	R?	R
(7)	Copenhagen Market	(A)	R	S	-	R	S	R	S
(30)	do	(F)	-	S	-	S	-	S?	S
(52)	do	(L)	S	S?	-	S	-	S	S
(64)	do	(L2)	R	VS	-	VS	-	R?	S
(8)	Red Acre	(A)	-	-	-	R	-	R?	R?
(27)	do	(F)	-	S	-	S	-	S?	S
(9)	Jersey Wakefield	(A)	S	S	-	S	S	S?	S
(63)	do	(L)	no germination						
(66)	do	(L2)	no germination						
(69)	do	(L3)	-	S	-	S	R	S	S
(10)	Marion Market	(A)	-	-	-	-	-	R?	S?
(16)	do	(F)	-	S	-	S	-	R?	S
(51)	do	(L)	R	R?	-	R?	R?	R	R?
(11)	Golden Acre	(A)	S	S	S	S	-	S	S
(12)	Early Glory	(A)	R	R	VS	S	S	S	S
(13)	Glory of Enkhuizen	(A)	-	S	S	S	S	S	S?
(31)	do	(F)	no germination						
(56)	do	(L)	S	R	-	S	-	S	S
(76)	do	(F2)	-	S	-	S	R?	S	VS
(14)	Charleston Wakefield	(A)	VS	S	S	S	S	S	S
(32)	do	(F)	-	R?	-	S	-	S	S
(55)	do	(L)	S	S	R?	S	-	S	S
(15)	Resistant Glory	(F)	no germination						
(74)	do	(F2)	-	S	R	S	-	R	S
(17)	Ferry's Round Dutch	(F)	no germination						
(60)	do	(L)	S	R	-	S	-	R	R?
(75)	do	(F2)	-	S	S	S	-	S	S

Table 1. (Continued)

Variety No.	Variety	Seed source[a]	Series ratings						
			C	E	F	G	H	J	K
(18)	Mammoth Red Rock	(F)	S	S	-	S	S	S	S
(20)	Bonanza	(F)	-	S	VS	VS	VS	S	VS
(21)	Bugnar	(F)	-	S	-	S	R	S	S
(22)	Resistant Detroit	(F)	HR	S	R	S	-	S	S
(23)	Early Jersey Wakefield	(F)	-	S	-	-	-	R?	S?
(25)	Allhead Select	(F)	-	S	-	S	S	S	S
(70)	do	(L)	-	R	R	S	S	S	S
(28)	Ferry's Hollander	(F)	-	S?	-	S	-	S?	S
(29)	All Head Early	(F)	S	S	R	S	-	S	S
(33)	Globe	(F)	-	VS	-	VS	R?	S	VS
(34)	Volga	(F)	-	S	-	S	R?	S	S
(35)	Penn State Ballhead	(F)	-	S	R	S	-	S	S
(36)	Midseason Market	(F)	-	S	-	S	-	S	S
(37)	Green Acre	(F)	-	S	-	S	-	R?	S
(38)	Oakview Ballhead	(F)	-	S	-	R?	-	R?	-
(39)	Wisconsin Hollander	(F)	-	S	-	S	R	S	S
(40)	Wisc. Ballhead Imp.	(F)	-	S	-	S	R?	S	S
(41)	Stein's Flat Dutch	(F)	-	S	S	S	S	S	VS
(49)	do	(L)	S	S	-	S?	-	R	S
(68)	do	(L2)	-	S	-	S	S	S	S
(42)	Slow Bolting Flat Dutch	(F)	-	S	-	S	-	S	S
(43)	Resistant Golden Acre	(F)	-	S	-	S	-	S	S
(44)	Medium Copenhagen	(F)	-	S	-	S	-	S	S
(45)	Jersey Queen	(F)	-	S	-	R	-	S	S
(46)	Savoy Chieftain	(F)	-	S	-	S	-	S	S
(62)	do	(L)	no germination						
(47)	Round Red Dutch	(F)	-	S	-	S	-	R?	S
(48)	Improved Globe	(L)	S	S	-	S	R?	R	S
(50)	do	(L2)	S	-	-	-	-	-	-
(53)	Wisc. Ballhead	(L)	-	R	R?	R	-	R	R?
(57)	Late Flat Dutch	(L)	S	-	R	S	R	S?	S

Table 1. (Continued)

Variety No.	Variety	Seed source[a]	Series ratings C	E	F	G	H	J	K
(58)	Earliest of All	(L)			no germination				
(59)	Reed's Ballhead	(L)			no germination				
(67)	do	(L2)	-	R	S	S	VS	S	VS
(61)	Huguenot	(L)	S	S	S	S	R	S	S
(65)	Madison	(L)	S	R	-	R	R	S	S
(73)	Chinese (Var.?)	(A)	-	S?	R	R?	-	R	R
(77)	Caluiflower Early Snowball	(A)							S
(78)	Super Snowball	(A)							S
(79)	Snowdrift	(A)							S
(80)	Number 5	(A)							S

[a] Seed from three different sources, (A), (F) and (L) were used. The numeral following the letter indicates another lot number of the same variety.

It was of interest to note that the varieties or strains which were classed as resistant at the time readings were made developed symptoms of black rot in the cotyledons a few days later. On checking back through dates-of-germination notes, it was found that, on an average, they germinated 2.6 days later than susceptible varieties and 2.2 days later than those classed as both susceptible and resistant. For example, the (A) strain of Premium Late Flat Dutch germinated 5.8 days later than the (F) strain, and the (A) strain of Red Acre 5.8 days later than the (F) strain. On the other hand, the (F) strain of Succession germinated 1.6 days later than the (A) strain. Whatever this difference in rate of germination was due to, there was definitely a correlation between the disease ratings and the time of germination.

During the exploratory phases of this work, it was noted that in most of the cabbage varieties there were usually a few plants that did not develop symptoms of black rot. This suggested that these plants escaped infection, that symptom expression in them was considerably delayed, or that they possessed a high degree of resistance. It was therefore considered advisable to save such plants for further observation. Thus, after readings were made in each series, all plants in each pot which had disease symptoms were rogued and the apparently healthy ones were later transplanted to individual pots. The number of healthy plants in each pot usually varied from 1 to 30 of an estimated total of 550 plants, although sometimes all were diseased. Some of these apparently healthy plants later developed local or systemic symptoms of black rot, even as late as the flowering stage. However, between 300 and 400 apparently healthy plants of different varieties of cabbage have been selected out of an estimated 350,000 plants from inoculated seed. Of the estimated 2500 cauliflower seed tested thus far, only one plant apparently free of black rot has been obtained. There was no correlation between disease ratings and the number of apparently healthy plants. It is planned to self as many of these plants as possible and test the progeny for their reaction to black rot.

DISCUSSION

Results of this exploratory work indicated that there was a perceptible difference in the degree of susceptibility of cabbage seedlings in the varieties used. This difference appeared to be correlated with the time required for germination, since those varieties which consistently were rated as resistant germinated, on an average, 2.5 days later than those classed as susceptible. Since the seed in all varieties and strains in each series were subjected to the same amount of inoculum for the same period of time under like conditions, it could be assumed that symptoms would have developed at about the same time if all the varieties and strains had been equally susceptible. It must be pointed out, however, that symptoms of black rot later

developed in the cotyledons of the resistant varieties, and that when diseased plants were rogued there was no correlation between the number of healthy plants and disease classification. This would suggest there was no resistance in the seedlings of the cabbage varieties tested. Whether the delay in symptom expression occurs on heading plants of these varieties under field conditions remains to be determined.

It was of particular interest to note that in these tests a small percentage (less than 0.1 percent) of plants of different varieties did not develop symptoms of black rot, even when grown to maturity. At the present time it is not known whether these plants escaped infection or whether they might possess a high degree of resistance. If resistance to black rot can be obtained through selection from a large population of inoculated seed, there arises the possibility of using a similar technique to select other disease-resistant plants.

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NOTES ON THE INCIDENCE OF THE DISEASES OF COTTON IN SOUTH CAROLINA IN 1950

Robert Aycock and C. H. Arndt

The losses from boll rots in South Carolina in 1950 that were not associated with injury by insects were relatively small as compared with those for 1949, [1] when losses for the State as a whole averaged above 30 percent. In 1950, because of the relatively favorable temperatures and the absence of any prolonged period of rainfall after the first bolls became mature, boll rots at the end of the third week in August were practically non-existent throughout the State, except as associated with injury to the bolls by the boll weevil or bollworm. Since at that time the incidence of boll rots was directly correlated with the degree of insect control, in fields with good insect control, the losses from insect-boll rot injury were generally less than 5 percent. Also because of the generally dry weather, the rots associated with insect injury often did not extend beyond the cell (lock) punctured by the insects.

The comparative weather records for 1949 and 1950 would seem to indicate that the amount of boll rot in these two years was related to the amount of rainfall in August rather than to that in July. In 1950 the mean July rainfall for the State was about 50 percent greater than in 1949; while for August, the 1949 rainfall was 2.7 times that for 1950. Also in 1949, a large portion of the precipitation occurred in the first two weeks of August, a period of almost no rainfall in 1950. Although the rainfall of July 1950 was relatively high, conditions were generally unfavorable for infection of the bolls, since there were no prolonged periods of high humidity. Locally heavy showers did result in abundant leaf infection by Xanthomonas malvacearum.

A period of high humidity and frequent showers from August 21 to September 9, 1950, greatly increased the number of rotted bolls and also the extent of injury by the infecting fungi when infection followed injury by insects. During this rainy period many of the bolls in the Coastal Plain began to dehisce. The prevailing high humidity delayed the rapid opening of these bolls; and many of them were consequently infected and rotted to some extent by various fungi. As a result, the viability of much of the seed that was derived from the seedcotton picked during or immediately subsequent to this rainy period was relatively low. The weather after September 9 was relatively dry and warm; and little new boll rot developed after September 9, except that associated with insect injury.

A total of 1787 mature bolls were collected from 17 locations selected at random during the second week of September at the Edisto Agricultural Experiment Station, Blackville, South

[1] Arndt, C. H. Boll rots of cotton in South Carolina in 1949. Plant Dis. Reptr. 34: 176. 1950.

Carolina. Of these bolls, 21 percent were rotted to some extent by fungi. Of the rotted bolls, 57 percent showed definite evidence of previous injury by either the boll weevil or bollworm. Other bolls may also have been injured by insects, although previous insect injury could not be established because of the smallness of the punctures into the lock or subsequent decay. Since 57 percent of the rotted bolls had previously been injured by insects, the maximal boll rot not associated with such injury could not have exceeded 43 percent of the rotted bolls, or 9 percent of the total number of mature bolls at the time of collection. A large percentage of the rotted bolls that did not show previous injury by insects were those which had begun to open during the period of frequent rainfall and which were rotted by fungi before there was a sufficient amount of dry weather to induce wide separation of the carpels and subsequent drying of the seedcotton.

About 80 percent of the bolls injured by insects and fungi were completely decayed and did not form normal seedcotton in any lock. Most of these bolls were covered with the dense sporulating mycelia of Diplodia gossypina. This same fungus with abundant pycnidia was found on the older portion of the stalks in early September. Although most observations indicate that D. gossypina is a secondary parasite of immature bolls, this fungus, after infection has occurred, rots the interior of immature and mature bolls more rapidly than the other fungi usually associated with boll rots.

The anthracnose fungus, Colletotrichum (Glomerella) gossypii, was found on 25 percent of the bolls in which one or more locks were not rotted. Other fungi infecting these bolls were Fusarium spp., D. gossypina, and species of Cephalothecium, Alternaria, Aspergillus, Penicillium, and Botrytis. Most of the bolls in this category had one or more carpels punctured by bollworms.

In discussions of the boll rots of cotton, apparent differences of opinion as to their etiology have arisen. In most instances, the differences have arisen from the sense in which the term "boll rot" has been used. In this paper, the term "boll rot" has been used to designate fungal infections or rots that occur before the actual splitting of the carpels occurs in the initiation of boll dehiscence. It is suggested that some other term, such as seedcotton rot, be used for fungal infections and rots that occur after the initiation of dehiscence so as to eliminate ambiguities that may arise from the use of the term "boll rot" to describe both types of rot. A distinct term for each type of rot seems desirable, since certain fungi that rot seedcotton usually do not infect unopened bolls until after they have been injured by insects or have been previously infected by other pathogens.

Infection of young cotton plants by Ascochyta gossypii resulted in extensive losses for the fourth consecutive year in localized areas of South Carolina. The well-defined areas in which this blight was prevalent in 1950 appeared to be related to heavy showers during certain critical periods. As stated by Smith[2] the disease was prevalent only in fields in which cotton followed cotton. One instance was observed in which the disking of the old stalks into the soil six weeks before planting greatly reduced the incidence of the blight as compared with another part of the field in which about 10 percent of the old stalks had been left standing until immediately before planting. In this locality, abundant Ascochyta lesions were present on the leaves of the larger plants in late September, 1949. Lesions were more abundant on well-shaded leaves of large plants in lower parts of fields than on smaller plants on better drained areas. Observations on varietal resistance were in agreement with those of Morey and Miller[3] and also those of Smith[4].

Several unusual features that were associated with the losses of cotton seedlings in South Carolina in 1950 appear worthy of recording. From April 5 to 25, during which period most of the cotton seed was planted, the rainfall throughout most of the State was insufficient for germination of the seed. This dry weather was followed by a period of nine days of relatively high temperature and abundant, well-distributed showers. As a result, uniform stands of vigorous seedlings appeared almost simultaneously throughout the State, a fact which was surprising because of the generally low viability of much of the planting seed. Emergence was followed by three weeks of dry, warm weather, during which period the seedlings were severely injured by a heavy infestation of thrips. This dry period was followed by about a week of frequent showers, heavy in some areas. It was during the latter portion of this rainy period and the following week of relatively warm, dry weather that an extensive loss of the seedlings occurred. Examinations of the seedlings disclosed abundant infection of the hypocotyls by Rhizoctonia solani. In some of

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[2]A. L. Amith. Ascochyta seedling blight of cotton in Alabama in 1950. Plant Dis. Reptr. 34: 233-235. 1950

[3]Morey, D. D. and J. H. Miller. Ascochyta blight of cotton in Georgia in 1949. Plant Dis. Reptr. 33: 310-311. 1949.

[4]loc. cit.

the fields in which cotton followed cotton, the aerial portions of the seedlings were also infected by Ascochyta gossypii. During the dry, warm weather that followed this last mentioned rainy period, it is likely that the infection by R. solani would not have caused extensive seedling losses if the growth rate of the seedlings had not been greatly reduced as a result of injury by thrips and in some instances by the Ascochyta blight.

The total acreage of the fields on which no cotton was produced because of seedling losses was inconsequential. On a much larger acreage, the losses resulted in irregular stands of plants. The greatest adverse effect of the injury to the seedlings by fungi and thrips on yields was the resulting delayed crop maturity and the associated greater damage by fungi and insects to the bolls and seedcotton.

EDISTO AND CLEMSON SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATIONS

A LEGUME ROOT ROT SURVEY IN SOUTHWESTERN ONTARIO IN 1950

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A survey of root rots in forage legumes was conducted in Southwestern Ontario from early April until late June, 1950. In all, 25 sweetclover fields (300 acres) and 10 alfalfa fields (150 acres) were examined. The majority of the fields were visited at least twice.

Winter injury, in the form of heaving, was the most serious trouble encountered, and it caused severest damage on low ground. In some fields, up to 75 percent of the plants were killed by root dessication following heaving. The heaved plants that survived developed into weaker, shorter, poorer yielding plants than those that had not heaved. In no case was a correlation obtained between the amount of root rot and the amount of heaving.

In the majority of fields examined a trace of root rot was present. Specimens were collected from all fields, and isolations generally yielded Fusarium species of different types. The majority of these isolates were probably secondary or weak parasites. Although several inoculations have been made the pathogenicity of none of these isolates has been established. Further tests are being conducted.

Damage caused by Phytophthora cactorum (Lib. & Cohn) Schroet. was severe in two sweetclover fields in Essex County. According to reports by plant pathologists at the Dominion Laboratory of Plant Pathology, Harrow, Essex County, this disease is serious in that area. A similar disease was observed by the authors in a self-catch field of sweetclover near Jarvis, Haldimand County. The causal organism has not been identified yet.

Root rot was severe in two alsike fields (60 acres) in Haldimand County, when examined in August. About 100 percent of the plants in one field and 35 percent in the other exhibited root rots in varying degrees, with roots completely rotted off on many plants. No effects of the root rotting on the above-ground parts were noticed at harvest, which may be attributed to the cool, wet weather at the time. Under drier conditions these plants would, no doubt, have suffered severely from the root injury. These observations suggest the possibility that root rots have contributed to the poor alsike seed set which has been causing concern among growers in Southwestern Ontario in recent years.

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AN EPIPHYTOTIC OF CORN RUST IN THE NORTH CENTRAL REGION OF THE UNITED STATES

J. R. Wallin

Puccinia sorghi, the causal agent of corn rust, has been known for many years in this hemisphere. For a number of years in the corn belt, the pathogen has subsisted without much indication that it would seriously affect corn. In 1950 the situation changed. Corn rust became epiphytotic. The scope and severity of the disease and the contributing factors became of immediate concern because of the potential threat to the production of the nation's leading crop. If a pathogen such as P. sorghi, hitherto of minor importance, suddenly became a menace to corn production, the pathologists in the corn belt would be faced with the responsibility of recommending effective control measures. They would be confronted with a dearth of fundamental information concerning control measures and factors influencing corn rust epiphytotics.

To present the scope and seriousness of the corn rust problem as it existed in 1950, the plant pathologists in the North Central States were consulted for their observations and opinions pertaining thereto. Their data and opinions are presented and analyzed in the following pages together with mean temperature and humidity data for July, August, and September. The latter are presented for comparison because in eight of the following reports the 1950 weather conditions were mentioned as being unusually favorable to rust development.

State Reports

Iowa: G. Semeniuk and E. F. Vestal

"Puccinia sorghi was more prevalent on dent corn in Iowa during the 1950 season than in any year within the past two decades. It was more prevalent in the eastern one-fourth of the State than it was in the remainder. Yields were reduced an estimated trace to as much as 10 percent, with an over-all average of 1.5 percent. Inbred lines varied from susceptible to resistant at Ames, Ankeny and Shenandoah. No evidence was obtained from greenhouse studies that more than one race of the pathogen was involved. Whether the race that was prevalent during the 1950 season was different from those of previous years is not known. Temperatures during the season were subnormal over the State while rainfall averaged above and below normal depending upon the section. No relation was evident between these factors and the prevalence or severity of rust."

Illinois: G. H. Boewe

"Corn rust was present over the entire State. I believe that 100 percent of the plants were infected, at least I did not see a plant that was rust-free. The severity of rust infection varied a great deal. In some fields infection was light and in some it was severe, causing premature death of leaves below the ears in mid-September. Loss in yield is estimated at 2 percent in Illinois. This is the worst corn rust epidemic that I have seen in over 20 years. Rust was very severe in commercial sweet corn-canning areas of the State. Yields were disappointing and I believe rust was a very important factor. A reduction of 10 percent in yield of canning sweet corn is a conservative estimate. Probably high humidity was an important factor in causing the rust epidemic.

"Our rust loss is an estimate. We have Stewart's disease (Bacterium stewartii) and Helminthosporium leaf blight entering the picture. Both were as bad as or worse than in 1949."

Indiana: A. J. Ullstrup

"Corn rust caused by Puccinia sorghi made its appearance comparatively early and continued to develop and spread throughout the growing season. The disease was more prevalent in 1950 than it has been for the past 12 years in Indiana. It is very difficult to estimate the amount of yield reduction sustained because of this disease. Until quantitative field data are available, any figures on losses due to corn rust must be sheer guesses. Over Indiana as a whole a conservative guess might be up to 1 percent loss in yield. In some localized areas the loss may have been slightly higher. Since the differentials as well as the cultures of rust used in the early studies on physiologic specialization in P. sorghi are no longer available, it is practically impossible to say whether or not a new race or races were responsible for the epiphytotic in 1950. Until some evidence is available to show that new and more virulent races of P. sorghi were involved, it would probably be wiser to withhold judgment. The growing season in Indiana was characterized by relatively low mean temperatures and high average rainfall. These conditions probably contributed to the prevalence of the disease.

"The rust caused by P. polysora was more prevalent on corn in the Ohio River bottom lands than heretofore observed. This rust was more abundant than that caused by P. sorghi in these rather limited areas. The disease has probably been present in Indiana for some time, but it was not recognized as such until 1949."

Kansas: L. E. Melchers, C. O. Johnston, and E. D. Hansing -- Plant Pathology. L. A. Tatum -- Agronomy.

"The writers are agreed that corn rust Puccinia sorghi was more prevalent and destructive in Kansas in 1950 than in any year since 1913 (37 years). The reasons for this are not all known, but a careful analysis of environmental conditions in 1950 as compared with other years reveal some information regarded as pertinent. Also, it is recognized that the race or races of the rust organisms may have some bearing on the reasons for the epiphytotic. In general it may be said that corn rust was observed wherever the maize crop was grown in Kansas and this for the most part is in the eastern one-half of the State. It was present on all the hybrids commonly grown and in the few fields of open-pollination maize that were examined. In many hybrid fields the leaves were so severely rusted that the foliage was dying several weeks before the normal time for maturity. The writers have estimated a 3 percent yield reduction in Kansas. Rainfall for July was the highest ever recorded with an average of 8.71 inches for the State. In the eastern half of the State measurable precipitation fell on more than half of the days in July. Accompanying these excessive rains were the lowest mean temperatures ever recorded for July. These conditions of frequent precipitation and temperatures below normal continued into August and resulted in a condition favoring the development of rust diseases. The soil was thoroughly saturated to great depth, providing humidity. Temperatures below normal and a saturated soil resulted in heavy dews almost every night from July to November. The mild weather of September and October greatly extended the growing period of all fall crops. There was, therefore, an unusual combination of heavy summer rainfall, temperatures below normal, heavy frequent dews, and a long growing season, all of which favored heavy infection by corn rust as well as other summer and fall fungus diseases of plants.

"Inbred lines of corn varied greatly in their reaction to rust. Some lines were highly resistant and relatively free, other lines were highly susceptible and so severely infected that most of the leaves were dead by the latter part of August. In such lines most of the stalks produced only nubbins and some were completely barren. Hybrid lines of corn varied in their reaction to rust, from resistant to susceptible. None of the hybrids were so highly resistant as some of the inbred lines. Similarly none of them were so highly susceptible as certain inbred lines.

"According to our records during the last 37 years, corn rust has caused an annual loss of a trace or less with the exception of 1927. During this year rainfall was high during the growing season and corn rust was general and severe throughout the State. No estimate of the loss was made, however, for that particular year."

Minnesota: E. C. Stakman

"The consensus of those in the division who observed corn rust this summer is as follows:

"Distribution: Apparently widespread

"Prevalence: Rather high; more than there has been for several years

"Severity: Low

"Losses: Minor

"Reason for epiphytotic: Not known."

Missouri: C. H. Kingsolver--Plant Pathologist. M. S. Zuber--Agronomist

"Corn rust was unusually prevalent in Missouri in the 1950 season. While no extensive survey was conducted, reports indicated its occurrence in virtually all parts of the State. Temperatures in this season were considerably below normal and rainfall was much in excess of normal in virtually all areas. This wet period extended through the months of June and July, a normally dry period. In nearly all areas (except in the southeast lowland area) the fall months were dry.

"The cool wet period in spring and summer was evidently conducive to the development of corn rust. However, the dry fall periods may have reduced further development of the rust. Corn yields were unusually good, the State average (tentative 45 bushels) being only 0.5 bushels below the all time high in 1948.

"Corn rust was unusually abundant in the corn breeding nurseries this season. Early plantings were most severely attacked. Susceptible inbreds, notably CI 3, were severely damaged by

rust. However, rust is a major factor in the growth of CI 3 in Missouri.

"Sweet corn plantings were, in some cases, severely damaged by corn rust this season. From letters received from home gardeners it was apparent that rust was severe enough in some cases to affect ear set. Early plantings were most severely damaged.

"I hesitate to assign a yield loss figure due to corn rust to either field or sweet corn. In the absence of thorough survey and in the face of the high average State yield for field corn, it would seem that the environmental conditions prevailing this season, while conducive to rust development, were also highly favorable for corn production."

Nebraska: J. E. Livingston

"Corn rust was generally distributed throughout eastern and central Nebraska in 1950 in larger amounts than in any previous season. It was, however, not present in amounts that would permit us to say that it caused any loss in yield. In view of the fact that Nebraska had one of the highest yields in bushels per acre in recent years, one must conclude that it was not a serious factor in production.

"It seems to me that the most serious phase of the problem is the possibility that in the development of new hybrids, some may appear that will be extremely susceptible to corn rust. One hybrid line in the breeding nursery in Lincoln was completely destroyed by corn rust this past season. This was not a line that is being used in breeding work, however it does indicate that lines with greater susceptibility to rust than are being commonly used at present may be introduced in the future. This could have rather serious results."

North Dakota: W. E. Brentzel

"We here in North Dakota are pretty well aware of the fact that rust in corn was severe last year. It is true that some varieties such as Minnesota 13 hyrbids and some of the numbered hybrids were not severely damaged, but many other varieties and strains were most severely affected. Falconer, in particular, developed severe rust. I was unable to see as much of the corn in the State as I should have liked, but from my limited observations it appears that most of the damage occurred in the southeastern section. This of course, is the section in which most corn is grown.

"I have little to offer in the way of a suggestion as to where the rust came from. Like other rusts, the corn rust perhaps found a very favorable season for its development and was able to do considerably more damage than in an average year. All planting was very late and in general the weather conditions were favorable."

South Dakota: C. M. Nagel

"Corn rust was the most prevalent since 1950 and presumably the most extensive development in South Dakota for a good many years. In other years the rust was very spotty within an area of a field; perhaps a few leaves of the plants would have lesions and not all plants would be infected. However, during the past season the infection was 100 percent in many areas and started killing the leaves in many fields. What this severe increase was due to is not known with any degree of certainty; possibly the peculiarity of weather conditions. It was somewhat dry during the latter part of July and August, and perhaps below average in coolness; these would be the only unusual conditions that we are aware of that might have caused its build-up. The other possibilities may be the presence of a more virulent strain. Where it came from and how it gained its impetus is not known to us. The fact remains that it was an unusual development that appeared to possess devastating potentialities.

"With regard to the losses incurred, we had a rather early freeze in late August which killed the leaves of the corn in many localities. If this had not occurred and the corn had developed normally for another month undoubtedly the infection would have had an opportunity to exert considerable loss through leaf killing. We have no reliable figures in South Dakota, but I would estimate that the loss would be from a trace to 1 percent on 3 1/2 million acres of corn grown in South Dakota."

Wisconsin: J. G. Dickson

"In studying our rust notes from the past season in comparison with those from the past several years, I find chiefly an earlier development and heavier infection in 1950 compared with previous seasons. The reaction of inbred lines in both sweet and dent corn would indicate no concrete evidence of new races or more virulent races. We are of the opinion, based on the one season's observation, that early initial infection and the especially favorable season for rust development accounted in large part for the increased amount of corn rust."

Discussion

The above statements represent the observations and opinions on corn rust from those most competent on the subject in their States. Their reports suggest several obvious facts: (1) corn rust was widespread last year but took only a minor toll of the crop; (2) the cause of the epiphytotic remains unknown; (3) in the corn belt there exists susceptible corn germplasm which provides one of the basic requirements for an epiphytotic; (4) apparently, there are no control measures in the event that Puccinia sorghi should become increasingly devastating to the Nation's corn crop -- especially during a national emergency; (5) there is need among the States for a common, reliable basis for assessing losses to the rust pathogen.

In five State replies the percentage loss in yield from corn rust was estimated. In Table 1, these estimates are shown as percentages and as number of bushels lost. Also presented in the Table are the corn acreages and yields for the various States.

Table 1. Statistics on corn acreage, yield and estimated rust loss for ten North Central States.

State	Corn acreage for grain[a]	Yield		Estimated rust loss	Bushels rust loss
		Bushel/acre[a]	Total bushel	Percent yield	per State
Iowa	9,402,000	47	441,894,000	1.5	6,729,350
Illinois	7,987,000	51	407,337,000	2.0	8,313,000
Indiana	4,233,000	49.5	209,533,000	1.0	2,116,494
Kansas	2,494,000	35.5	88,537,000	3.0	2,738,257
Minnesota	3,936,000	39.5	155,472,000	?	
Missouri	4,033,000	45	181,485,000	?	
Nebraska	6,572,000	37	243,164,000	?	
North Dakota	422,000	22	9,284,000	?	
South Dakota	3,072,000	28	86,016,000	1.0	868,848
Wisconsin	1,221,000	44	53,724,000	?	
	43,372,000		1,876,446,000		20,765,949

[a]The statistics on corn acreage and average bushels per acre yield were obtained from the 1950 Crop Production issued by the U. S. Dept. Agr., Bureau of Agricultural Economics Crop Reporting Board.

The total estimated reduction in corn yield from rust for the five States was 20,765,949 bushels. Although the loss was only a minor percentage of the whole crop, it does represent an economic loss of some consequence. Undoubtedly, the total bushel loss shown above would be much greater if the losses from all States were known. The loss may be considered tolerable, but if P. sorghi becomes as destructive on corn in the North Central States as it does in southern sections of the United States and in Mexico and Central America, the losses might well become intolerable. Certainly, the corn crop is vulnerable to increasingly severe attacks of corn rust.

The low temperatures and high humidities that prevailed during the growing season were mentioned by pathologists as factors in the development of P. sorghi. As a matter of interest, the mean temperatures and relative humidities for July, August, and September in the ten States were compiled from the U. S. Weather Bureau's Climatological Data. The data are presented graphically in Figure 1.

Comparisons of the data in the figure indicate that Kansas, which reported the greatest percentage loss, had the highest morning and afternoon humidities during July. Also, Missouri had high morning and afternoon humidities during this month. During August, Kansas and Missouri had the highest humidities, day and night. Missouri had the highest mean temperatures for

MEAN RELATIVE HUMIDITY AND TEMPERATURE FOR THREE MONTHS IN TEN NORTH CENTRAL STATES

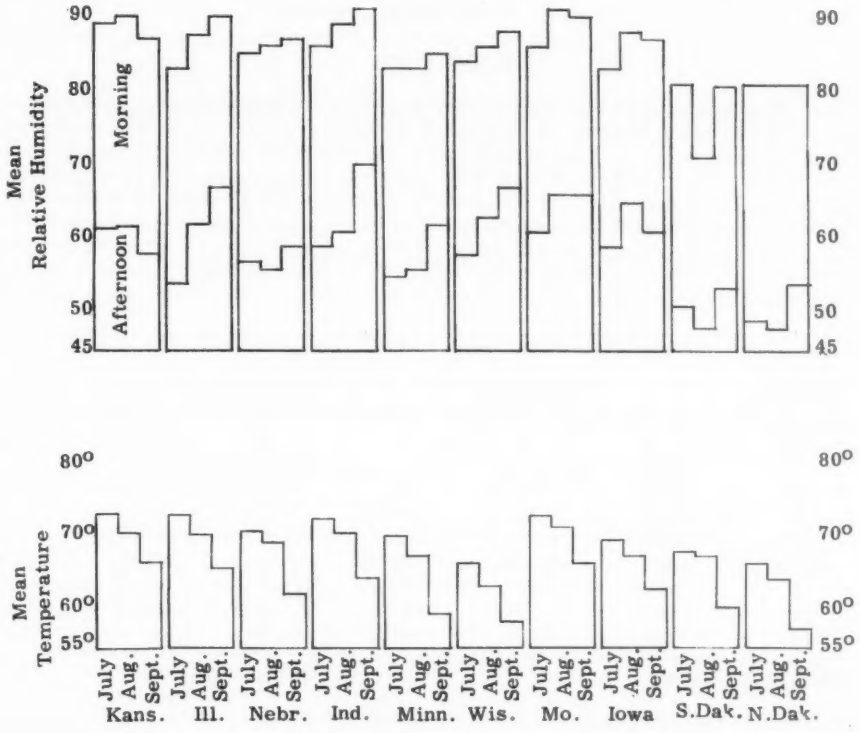

FIGURE 1.

August, 71.5° F., while Wisconsin had the lowest, 63.5° F. The mean temperatures were low for all States for the three months. Too, for all States, the September mean temperatures were considerably less than the August means. Certainly, if the pathogen is favored by high nocturnal humidities and generally cool temperatures, these conditions obtained for all States in the region during 1950. However, as yet the weather-disease data are too general to permit a clear interpretation of the influence of weather in rust development.

The outlook for corn rust might be summarized by saying that (1) in the light of our present knowledge, the behavior of P. sorghi and the factors influencing its development should be under surveillance, and that (2) Puccinia sorghi will be a potential threat in the corn belt until more is known of its capabilities, limitations and control. The pathologists in the leading corn States of the North Central Region are best qualified to judge what action if any, should be taken on the rust pathogen.

DIVISION OF MYCOLOGY AND DISEASE SURVEY, U. S. BUREAU OF PLANT INDUSTRY, SOILS AND AGRICULTURAL ENGINEERING, AMES, IOWA.

EDITORIAL NOTE: The report above presents very interesting food for thought. Corn rust, which for many years has been of no economic consequence, suddenly in 1950 caused an estimated loss in five states of 20 million bushels of corn or approximately 36 million dollars. It is doubtful if pathologists in general were aware of this situation until Dr. Wallin requested this information from collaborators. On the other hand, race 15B of Black Stem Rust of wheat caused an estimated loss in three States of 10 million bushels of wheat or about 24 million dollars and I am sure everyone has heard about this. Which constitutes the greater loss to our potential food and feed supply? -- P. R. M.

Dr. Dickson has supplied a percentage loss estimate for Wisconsin received too late for inclusion in the table, of 0.5 for all corn acreage harvested for grain. This amounts to 269,969 bushels loss. -- J. R. W.

PUCCINIA SORGHI AND HELMINTHOSPORIUM TURCICUM ON CORN IN IOWA DURING 1950

Edgar F. Vestal and G. Semeniuk

Puccinia sorghi

Corn rust (Puccinia sorghi) was unusually severe on commercial dent hybrids and dent inbred lines during the 1950 season. Only in 12 of the 62 years since 1889 has the prevalence of rust exceeded trace amounts, with estimated losses varying from 0.2 to 2.0 percent[1]. In 1950 infection was general over the State by mid-September but was greatest in the eastern part. Leaf infection severities on 59 farms in 39 counties (Fig. 1) varied from a trace to nearly 100 percent, the latter representing almost total leaf killing. The average yield reduction was estimated as 1.5 percent. No evidence was obtained in greenhouse trials that more than one race of the pathogen was involved. Inbreds varied in susceptibility at Ankeny, Ames, and on experimental plots at Shenandoah; the inbreds at Ames are shown rated in Table 1. There appeared to be no

Table 1. Rust infection on dent inbred lines grown at Ames, Iowa, 1950*.

Inbred	Total leaf area affected %	Inbred	Total leaf area affected %	Inbred	Total leaf area affected %	Inbred	Total leaf area affected %
A25	10	C103	5	N6	25	Os426	5
A73	40	L153	25	Oh07	5-10	Tr	65
B2	10	L159	40	Oh27	10-25	W22	40
B7	10-25	L205	10-40	Oh40B	10	WF9	40
B8	25	L289	5-10	Oh41	25-65	38-11	40
B10	40	L317	65	Oh51A	25	187-2	25
B14	65	M14	10-25	Os420	40-65	Hy	10

*Courtesy of G. F. Sprague.

correlation between rust severity over the State and temperature or rainfall. Temperatures from April to September, inclusive, were 2 to 5 degrees below normal for all parts of the State (Table 2) whereas rainfall was above normal in several sections (Table 3), and below in others. The lateness of corn development brought on by the abnormally cool seasonal temperatures and the above normal rainfall over most of the State during late June and July may have been the important factors in this unusual outbreak of rust.

Table 2. Temperature departures from normal (°F) for the months of April to September, 1950.

Iowa Crop district	April	May	June	July	August	September
Ia	-7	-3	-3	-8	-5	-2
Ib	-7	-4	-2	-8	-4	-3
II	-7	-2	-2	-6	-4	-2
III	-7	-1	-1	-5	-3	-2
IVa	-7	-3	-1	-8	-4	-1
IVb	-7	-2	-1	-7	-5	-2
V	-6	-2	-2	-6	-3	-1
VI	-4	0	-1	-5	-2	-2
VII	-5	-1	-2	-9	-6	-4
VIII	-6	-2	-3	-9	-6	-4
IX	-7	-2	-3	-6	-5	-2
STATE	-6	-2	-2	-7	-4	-2

[1]Estimates on file with the Department of Botany and Plant Pathology, Iowa State College, Ames, Iowa.

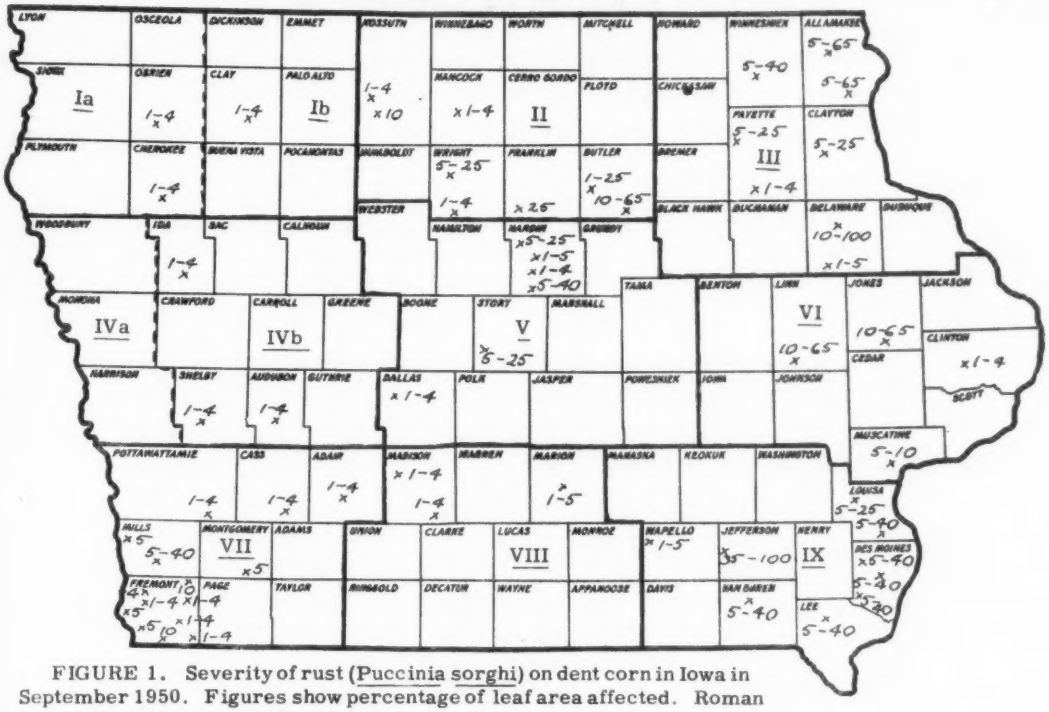

FIGURE 1. Severity of rust (Puccinia sorghi) on dent corn in Iowa in September 1950. Figures show percentage of leaf area affected. Roman numerals designate crop districts.

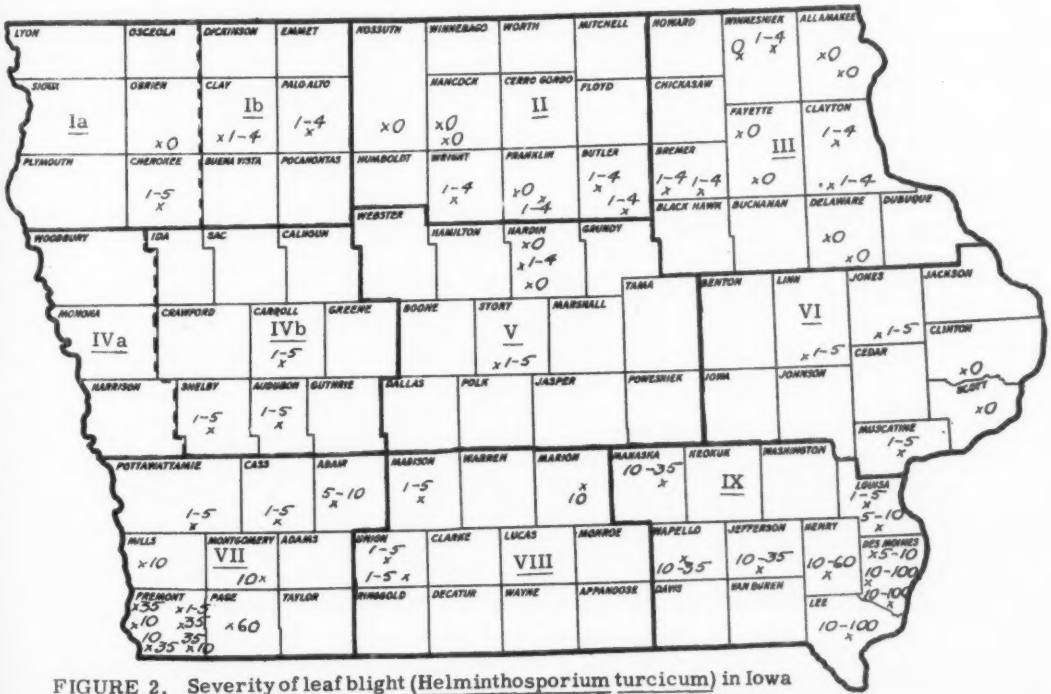

FIGURE 2. Severity of leaf blight (Helminthosporium turcicum) in Iowa in September 1950. Figures show percentage of leaf area affected. Roman numerals designate crop districts.

Table 3. Rainfall departures from normal (in inches) for the months of April to September, 1950.

Iowa Crop district	April	May	June	July	August	September
Ia	-1.7	+0.2	-0.3	+2.3	-2.4	-0.7
Ib	-1.5	+0.3	-0.7	+3.0	-2.4	-0.5
II	+0.5	+2.5	-0.4	+1.4	-2.5	-0.6
III	+1.0	+1.2	+2.2	+1.8	-2.6	+0.2
IVa	-2.0	+1.7	+0.3	+1.0	+0.8	-2.3
IVb	-0.7	+3.1	+2.5	+1.1	-1.6	-2.2
V	-0.9	+1.8	+1.8	-1.6	-2.1	-1.8
VI	-2.5	+0.3	+1.7	+0.8	-2.1	-1.8
VII	-0.9	+2.8	-1.1	+2.3	+0.7	+2.8
VIII	-0.3	+2.4	+1.4	+0.8	-0.4	+2.5
IX	+1.3	-0.1	+1.4	-0.2	-2.1	+2.5
STATE	+0.7	+1.5	+0.9	+1.1	-1.5	-1.6

Helminthosporium turcicum

Helminthosporium turcicum was first recorded for 1923 (1) and has since been observed sporadically over the years in isolated places (2), particularly in low lying areas. In 1949 it was observed in trace amounts in the southeastern part of the State, being found as far north as Cedar Rapids and as far west as Ames. It caused slight to no damage in most fields and severe damage in a narrow deep valley near Burlington.

In 1950 the disease occurred generally over the State, with the greatest amounts in the southeastern and southwestern parts (Fig. 2). Leaf infection severities on 63 farms in 43 counties varied from a trace to nearly 100 percent, the latter representing almost total leaf killing. Trace amounts were observed in early August in the northcentral part near Hampton, and trace to severe amounts in early September in the southern half of the State. Estimated yield reductions varied from a trace to 20 percent, the average being 1 percent. As with corn rust, late development of the corn together with above-normal rainfall during July may have been the factors that contributed to the general prevalence of H. turcicum over the State. Its greater abundance in the southeast and southwest fields cannot be explained from the available weather data.

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2. Vestal, E. F. Corn root rot in Iowa in 1944. Plant Dis. Reptr. 28: 1038-1041. 1944.

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY, IOWA STATE COLLEGE, AMES, IOWA

A LEAF GALL FORMING NEMATODE ON CALAMAGROSTIS CANADENSIS (MICHX.) BEAUV. [1]

S. Goto and J. W. Gibler

A nematode leaf gall was found in 1949 on bluejoint, Calamagrostis canadensis (Michx.) Beauv., growing on low land near St. Paul, Minnesota. No spread from the original locus of infestation, about three by nine feet in size, was observed in 1950.

The nematode and the galls it produces resemble Anguillulina graminophila and its galls described on Agrostis alba in England (2). According to Filipjev and Schuurmans-Stekhoven it has been found also on Agrostis tenuis in the United States (1). Following Thorne's classification of the Tylenchidae this nematode appears to be Anguina graminophila (Goodey) Chitwood (3)

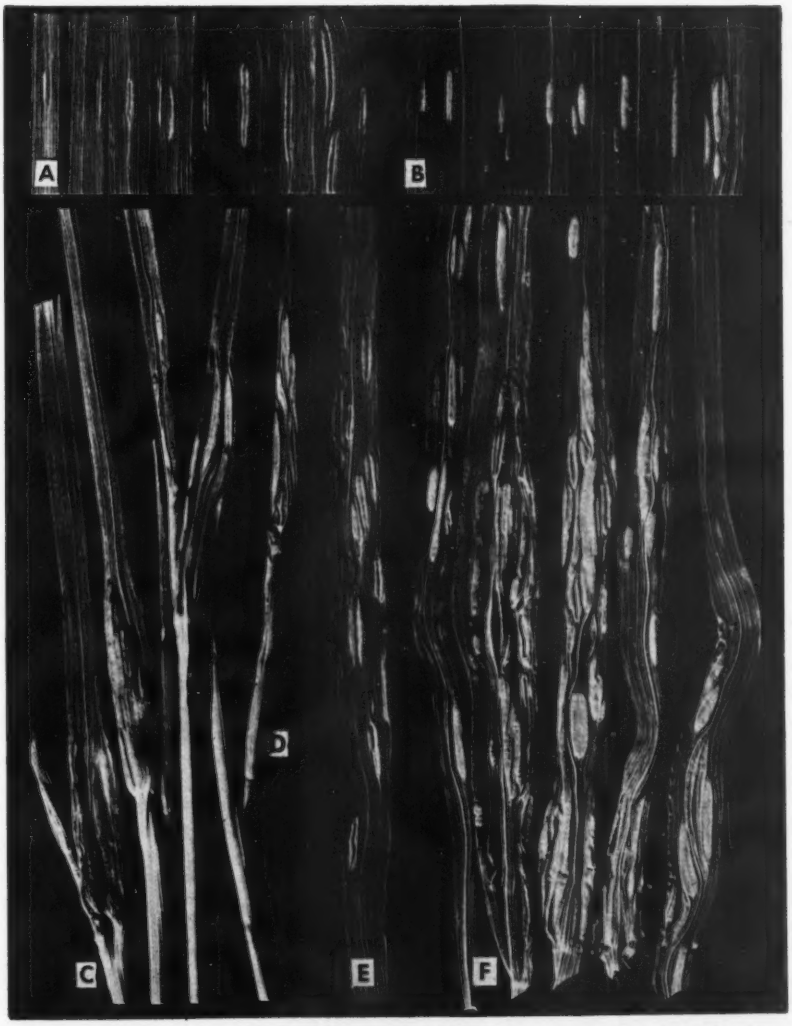

FIGURE 1. Nematode galls on leaves of Calamagrostis canadensis. A. upper side of galls. B. lower side of galls. C. old galls. D. gall on stem. E. distribution of galls on upper surface of leaf. F. distribution of galls on lower surface of leaf.

[1] Paper No. 743, Misc. Journal Series Article, Minnesota Agricultural Experiment Station.

The early symptoms are light yellowish green specks to larger areas about 0.5 x 3.0 mm. in size. These later develop into bright yellow-orange to orange-brown galls 0.8 - 1.2 x 4.0 - 9.0 mm., with a deep longitudinal furrow on the upper surface which splits and permits exit of the nema (Fig. 1A, E). The lower side of the galls is smooth and rounded (Fig. 1B).

Galls may occur anywhere on the leaf (Fig. 1E, F) and the number varies greatly. They are sometimes so numerous at the base of the leaf as to cause a tight curling and a tubular appearance. Twisting and distortion of the leaf (Fig. 1F) and swellings on the stem (Fig. 1D) have been noted. There is no chlorosis or necrosis of tissues surrounding the galls. Old galls in which nemas are no longer present often are deep purplish in color. (Fig. 1C). Otherwise the plant does not appear to be adversely affected although emergence of panicles is prevented when the developing culm is attacked.

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DIVISION OF PLANT PATHOLOGY, MINNESOTA EXPERIMENT STATION

AN EXPLANATION OF THE REVISION OF THE ROOT-KNOT NEMATODES, MELOIDOGYNE SPP.

A. C. Tarjan

The root-knot nematode which, for a long time, had been known as Heterodera marioni (Cornu) Goodey has recently been found to be comprised of at least five different species and one variety, which have been separated from the genus Heterodera and placed in the genus Meloidogyne Goeldi 1887 by B. G. Chitwood (1). This has created some confusion in the minds of certain workers who may doubt the validity of this reclassification.

The genera Meloidogyne and Heterodera have several similar characteristics. Both are included in the subfamily Heteroderinae and have similar patterns of development. Also in both the males are eel-shaped and the females saccate to spheroid with an elongated neck. The following points of dissimilarity are striking enough, however, to justify the placing of the root-knot nematodes in a different genus. Whereas Meloidogyne females are soft-bodied with the cuticle never forming a tough, protective cyst, Heterodera females, at maturity form a durable cyst. In Meloidogyne, eggs are deposited outside the body in a gelatinous matrix and are never retained in the body, while in Heterodera the eggs may or may not be deposited in a gelatinous matrix and are partly retained in the dead female which forms the protective cyst mentioned previously. Females of Meloidogyne are distinctive in the formation of a "fingerprint-like" pattern of the cuticle around the vulva, while females of Heterodera never show this pattern but usually show "lace-like" markings and punctations in the cuticle. Females of Meloidogyne generally cause characteristic root galls or knots on susceptible plants and are almost completely enclosed within the tissues of the root at maturity, while in Heterodera, the females usually cause no gall formation and may be found at maturity with the major portion of the body located outside the root. Free-living larvae of Meloidogyne have stylets about 10 microns in length while in Heterodera, the stylet is 20 to 29 microns in length.

Differences between species of Meloidogyne are based on morphological characters as well as variations in pathogenicity to some host plants. Work currently in progress in the Division of Nematology indicates that there are also decided differences in the response of snapdragons to infection by different species of root-knot nematodes.

Reference:

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DIVISION OF NEMATOLOGY, U. S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, BELTSVILLE, MARYLAND

OBSERVATIONS ON NEMATODES ASSOCIATED WITH DECLINE OF ORNAMENTAL PLANTINGS

A. C. Tarjan

In the course of routine examinations of soil and root samples from a variety of ornamental plants which are sent to the Division of Nematology, various plant-parasitic nematodes are often observed. Presented below is an account of some of these observations.

No attempt will be made to give a complete list of all of the nematodes found in each case. Only those nematodes which are accepted or suspected plant parasites will be mentioned, and specific names will be omitted for purposes of brevity.

African violets have only recently been reported as being attacked by nematodes. Root knot, caused by Meloidogyne spp., has become a recognized disease of these popular ornamentals, while meadow nematodes, Pratylenchus spp., have also been discovered infecting African violets on several occasions. In a plant from Hyde Park, New York, numerous specimens of pin nematodes, Paratylenchus sp. were observed feeding on the roots, and attempts to inoculate healthy plants and maintain this nematode population were quite successful. Several African violets submitted by a nursery in Cincinnati, Ohio were also found bearing severe infections of pin nematodes. In all of these cases the plants were unhealthy in appearance with a conspicuous number of dying or decayed roots.

Yew (Taxus sp.) shrubs from a planting in Takoma Park, Maryland had shown poor growth for some time. Soil and root samples from these plants revealed the presence of the following nematode genera: Tylenchorhynchus, Tylenchus, Diptherophora, Dorylaimus, and Nothotylenchus. Similar samples from a nursery in Washington, D. C. were found to contain Helicotylenchus, Psilenchus, Aphelenchoides, and Tylenchus, all in fairly large numbers.

Certain elms in Washington, D. C. have, for a number of years, been shedding leaves prematurely, starting about the middle of the growing season. Root and soil examinations from a number of these trees revealed a large number of known and suspected plant-parasitic nematodes, including the following genera: Hoplolaimus, Xiphinema, Dorylaimus, Hemicycliophora, Longidorus, Ditylenchus, Helicotylenchus, Tylenchorhynchus, Tylenchus, Pratylenchus, Diphtherophora, and Criconemoides.

Boxwoods have been found, during the past decade, to be subject to a virulent disease caused by meadow nematodes, Pratylenchus spp. These parasites seem to be well distributed throughout the range of the host and have caused extensive losses throughout various home and commercial plantings. Other nematode genera frequently found associated with declining boxwoods are Helicotylenchus, Hoplolaimus, Dorylaimus, and Tylenchus. Infrequently found are Diphtherophora, Tylencholaimus, Xiphinema, Ditylenchus, and Hemicycliophora.

Although commercially grown apple trees cannot be considered as ornamental plants, there are several flowering apples that are used for decorative purposes, consequently the occurrence of pathogenic nematodes on one can be an indication of the degree of susceptibility to nematode attack of the other. From roots and soil of a group of apple trees growing in an orchard near Cumberland, Maryland the following known and suspected plant-parasitic nematode genera were observed: Diphtherophora, Tylenchus, Dorylaimellus, Dorylaimus, Xiphinema, and Criconemoides. Although the roots had no outstanding symptoms of injury, a general lack of vigor in the growth of the trees was apparent, and the farmer reported a noticeable decrease in yield.

There has been striking evidence of decline of pin and red oaks around Wilmington, Delaware. Investigations of this condition revealed that once mature trees show symptoms of decline, the greater part of their root systems will be necrotic. Dead roots do not usually contain root-parasitic nematodes for these parasites must have living tissue on which to feed. In view of this fact, numerous examinations of oak seedlings in the endemic area were made and revealed the presence of Hoplolaimus coronatus Cobb on the roots of the greater majority of the seedlings examined. In one case, a mature tree which had almost died of the disease was rejuvenated by the addition of organic matter to the soil. Several root samples from this tree also revealed the presence of H. coronatus. Examination of roots and soil from declining red oaks in Rehoboth Beach, Delaware likewise revealed the presence of H. coronatus. Along with this species occurred the following genera: Tylenchus, Dorylaimus, Longidorus, Psilenchus, Hemicycliophora, and Tylencholaimus, all of which are either known or suspected plant parasites. Root samples from declining white oaks growing near Oakland, Maryland, were found to contain ring nematodes, Criconemoides sp. At the time these samples were submitted it was learned that a number of white oaks in the vicinity of the sampled trees were similarly affected. Fortunately the trees recovered sufficiently and similar marked symptoms of decline failed to appear dur-

ing the following summer.

Inspection of roots and soil from two unhealthy red cedar trees from Rehoboth Beach, Delaware resulted in the finding of species of Tylenchus, Diphtherophora, Dorylaimus, Xiphinema, Helicotylenchus, and Hoplolaimus. Examination of holly roots and soil in the same area showed the presence of Helicotylenchus, Xiphinema, and Hoplolaimus.

Chrysanthemums from Virginia were found to be parasitized by large numbers of a species of pin nematodes, Paratylenchus. In another examination, soil from greenhouse beds in New Jersey in which chrysanthemums had failed to grow was found to contain species of Pratylenchus, Dorylaimus, Criconemoides, and Xiphinema.

Although there are many different kinds of nematodes which occur in soils, only a small number of these have been generally accepted as being plant parasitic. Most of the plant-parasitic nematodes occur in the suborder Tylenchina and the superfamily Dorylaimoidea, of the phlyum Nematoda. One of the salient features of these groups is the occurrence in the anterior end of the nematode of a stylet or spear, which is capable of being extruded. This structure is known to be used by a few species of the Tylenchina in feeding on the roots of plants (1), and intestinal contents of many species of the Dorylaimoidea have been identified as coming from plants (2). Since the genera listed above are of these groups and are similarly equipped with stylets, they also are believed to be plant parasitic. Their frequent occurrence around the roots of declining plants in large numbers supports this view, although definite experimental evidence is lacking.

Plant-pathogenic nematodes are found in all types of soil and may be either endoparasitic or ectoparasitic in habit. Common endoparasitic forms such as the root-knot nematodes, Meloidogyne spp., and the meadow nematodes, Pratylenchus spp., are often easily found by merely teasing apart infected root tissues. Ectoparasites, however, are often more difficult to discover. Although part of the head and the stylet of the nematode may be located within the rootlet, the greater part of the body is in the soil and any attempt to dislodge the soil from the roots may also succeed in dislodging the nematodes from their feeding sites. For this reason the investigator often sees only a few or no nematodes in the root and does not consider them as a possible pathogenic factor. A critical examination of the nematode fauna of the soil around the roots should also be undertaken in any search for root-attacking nematodes.

In the several cases of decline of certain ornamental plants presented above, it cannot be claimed that the associated nematodes definitely caused the unhealthy condition of the plants since experimental work of this nature has been sadly lacking. It can be said, however, that these nematodes may have been responsible, at least in part, for the symptoms of decline exhibited by the plants. As more and more accurate information is collected concerning the nematode fauna associated with declining plants, we may eventually accept the seriousness of the nematode problem just by the staggering weight of evidence. The realization of the great threat which nematodes offer to the successful culture of crop and ornamental plants may then stimulate much needed research into the problem.

References:

1. Steiner, G. Plant nematodes the grower should know. Proc. Soil Sci. Soc. Fla. IV-B: 72-117. 1949.
2. Thorne, G. A monograph of the nematodes of the superfamily Dorylaimoidea. Capita Zoologica 8(5): 1-261. 1939.

DIVISION OF NEMATOLOGY, U. S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

A DUSTER FOR ROW APPLICATION OF FUNGICIDE AND/OR INSECTICIDE AT THE TIME OF SOWING SEEDS

A. G. Newhall and W. W. Gunkel

The method and equipment recently employed on the mucklands of New York in the control of onion smut and maggot by blowing a fungicide-insecticide mixture into the furrow along with the seed have aroused wide interest, not only because they promise a better way to control these two onion pests but because the method may lend itself to the control of other seedling diseases and insect pests of a wide variety of crops by a single operation at the time of sowing seed.

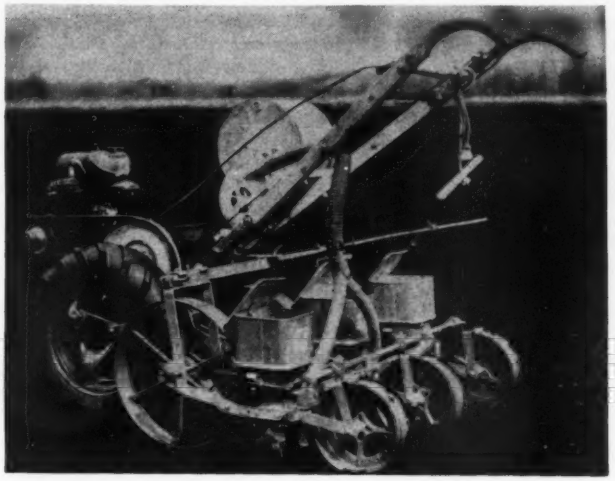

FIGURE 1. Chain driven rotary duster on a small tractor driven seeder used in 1950 experiments.

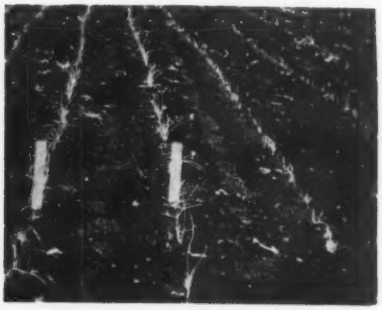

FIGURE 2. Two rows of onions on left received Tersan-Dieldrin mixture blown in furrow at time of seeding. Thrips attacking checks on right. Photo October 4, one month after sowing.

Table 1. Some field results in the control of onion smut by blowing dust into furrow with the seed, and by seed pelleting.

Treatment : Farms --	Percent smutted seedlings					: Yields in bushels per acre				
	1	2	3	4	5	: 1	2	3	4	5
Check	19	22	23	23	48	326	166	337	487	-
Thiram + Pyrax blown in	.3	-	-	.3	-	670	-	-	936	-
Tersan + Dieldrin blown in	.5	5.6	4	-	-	530	648	714	-	-
Tersan + Pyrax blown in	-	-	-	-	4	-	-	-	-	-
Tersan pellets	.2	7.6	15	1	15	690	463	753	923	-
Orthocide pellets	1.6	2.6	6	.9	23	670	390	695	1043	-

A brief description of the equipment used in 1950 is therefore given for the benefit of those who may wish to try it on other crops. A root rotary hand duster, model 3C, is mounted on the handles of a Planet Jr. B36- 3-row drill drawn by a 1 1/2 h.p. walking tractor, model BP 1. The blower is turned by a bicycle chain from a sprocket mounted on the hub of the tractor so it only operates when the clutch is engaged and the tractor is moving forward. The tractor's rubber tires are 4 x 12 inches and the number of teeth on the lower and upper sprockets are 22 and 24 respectively, which at ordinary rate of walking gives the blower about the right speed. The outlet of the blower is divided so the dust is applied to two rows through 1 1/4 inch flexible tubing, leaving the third row for a check. A quick way of detaching the duster for weighing would be highly desirable on an experimental model like this. Since in practice the dust flow regulator was seldom opened past the first notch the duster would seem to have sufficient capacity for several more rows provided even distribution can be obtained.

In 1949 field tests the same blower was mounted on a single-row hand-operated drill. Smut was not very serious in the six fields where tests were made and the data obtained were not very striking although significant. In 1950, with the 3-row tractor-drawn equipment illustrated in Figure 1, tests were made on 20 farms and significant data obtained from over half of them. Several were blown out. The following fungicide mixtures gave rather good control of smut at 20 to 30 pounds per acre (1) thiram-Pyrax 1:1, (2) Tersan-Pyrax 1:1, (3) Tersan-insecticide 1:4, (4) Orthocide-Pyrax 1:1. Of special interest is the Tersan-insecticide mixture because even at 30 pounds per acre only about 3 pounds of active thiram was applied on 7 miles of row, which is near the optimum according to Linn's recent work with onion seed pelleting. [1]

This fungicide-insecticide mixture consisting of one pound of Tersan (50% thiram) to four pounds of Dieldrin dust (25% active), which, as already reported by Rawlins and Newhall [2], gave remarkable control of onion maggot in the summer, was given further tests in September on four muck farms where a crop of onions had just been removed. Thrips were evidently abundant in the soil and during the month they destroyed most of the seedlings in the check plots but left the treated rows alone, so that 30 days after sowing the stands in the untreated rows were reduced to one third of those in the treated rows (Table 2, Figure 2).

Table 2. Control of thrips on seedlings by blowing Tersan and Dieldrin into furrow while sowing seeds. 1950

	Mean stands of onion seedlings per 60 feet of row after 30 days (highly significant)	
	Check	Dusted
Farm 1	91	259
2	81	261
3	42	139

The successful use of such small amounts of fungicide and insecticide per mile of row (0.5 pound and 0.8 pound active) suggests that it might be profitable to try the method on other crops, such as beans, corn, cotton, or whatever crops, sown from seed, are attacked by thrips, stem rots, and maggots or wireworms in the seedling stages. The protection of cotton seedlings from thrips and damping-off in this manner conceivably might hasten the maturity of the crop and increase yields in critical regions where the season is short.

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[1] Linn, M. B. Control of smut in bulb onions by pelleting the seed with technical thiram. Plant Dis. Reptr. 35(2): 94-96. 1951.

[2] Rawlins, W. A. and A. G. Newhall. An improved method for applying insecticides for onion maggot control. Jour. Econ. Ent. 43(6): 950-951. Dec. 1950.

NEW OR UNUSUAL RECORDS OF PLANT DISEASES

SETARIA VIRIDIS, A HOST OF WHEAT MOSAIC

By John T. Slykhuis [1]

Wheat mosaic of the western type [2] was first found in South Dakota in 1949 when diseased plants were observed in fields in three counties in the south-central section of the State. Field surveys during the summer of 1950, confirmed by transmission tests made in the greenhouse, established the presence of mosaic in 16 counties. The disease was most prevalent in the south central counties where both winter and spring wheats are grown, but mosaic was also found in spring wheat in the northeastern area where winter wheat is rarely grown.

Information on the annual survival of mosaic in the south-central area of the State was obtained by making periodic surveys during the spring, summer and fall of 1950. Winter wheat fields that contained diseased plants in October, 1949 showed evidence of severe mosaic when inspected early in May, 1950. The percentage of diseased plants in these fields increased during May and June. Mosaic also began to appear in winter wheat fields that had shown no evidence of mosaic early in May. Likewise, it appeared in spring wheat fields, particularly in those which were sown late in May near diseased winter wheat. These facts indictae that the virus can overwinter in infected winter wheat; then it can spread to healthy winter and spring wheat plants during the growing period.

By the first week in August when both winter and spring wheat were ripe, it was apparent that the viruses causing mosaic must survive elsewhere than in living wheat. Transmission tests did not reveal the presence of viable virus in ripe wheat leaves or straw. Furthermore, repeated tests failed to show that the disease was either seed- or soil-borne. The most likely hosts appeared to be certain annual grasses that were commonly abundant in wheat fields of the area from early summer until late fall. The following common "weed grasses" were tested as possible hosts: Setaria glauca (L.) Beauv., S. viridis (L.) Beauv., Echinochloa crusgalli (L.) Beauv., Panicum capillare L. Of these Setaria viridis, which was abundant in most fields and was frequently observed with mosaic symptoms, was proven repeatedly to be carrying a virus which was readily transmitted to wheat by the carborundum-rub method. The symptoms so produced on wheat appeared identical with the yellow streak mosaic. In reciprocal tests in the greenhouse the yellow streak mosaic and the green streak mosaic of wheat have been transmitted to 50 to 100 percent of Setaria viridis plants what were inoculated in the two- to three-leaf stage. It appears probable that in South Dakota S. viridis provides a method of perpetuating these viruses between harvest and the emergence of volunteer and fall-sown wheat. Winter wheat thus infected in the fall can harbor the viruses over winter.

SOUTH DAKOTA STATE COLLEGE, BROOKINGS

MICROSPHAERA DIFFUSA ON BLUE LUPINE

By G. E. Thompson

During September, 1950, several pots were planted with blue lupine (Lupinus hirsutus L.) for experimental purposes in the greenhouse. In December, the plants became infected with a powdery mildew. At that time only the conidial stage was present on the leaves. In late January and February, 1951, perithecia developed profusely on the leaves, petioles and in localized discolored areas on the stems, especially at the nodes.

The mildew has been identified as Microsphaera diffusa Cke. & Pk. Although this fungus has been reported on other legumes, it apparently has not been reported previously on this host.

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[1] Assistant Plant Pathologist, Department of Plant Pathology, South Dakota State College, Brookings, South Dakota.

[2] Several samples identified as green streak, others as yellow streak mosaic by Dr. H. H. McKinney, Senior Pathologist, Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering

NATURAL INFECTION OF PEACH FRUIT BY DIPLODIA

By M. A. Smith and W. R. Wright

During the progress of post harvest treatments of peaches for the control of various transit and market diseases at Fort Valley, Georgia, in 1950, 1 to 2 percent of the fruits in each of 9 different lots of Hiley and Sullivan Elberta peaches were observed to be affected with a disease that did not closely resemble brown rot, Rhizopus rot, or any other decays commonly encountered in the experiments.

At first the decay was soft and slightly watery; but the skin, unlike that in areas affected by Rhizopus, was relatively tenacious. After two days in storage at temperatures of 78-85° F., the disease had made rapid progress often involving 1/3 to 1/2 of the fruit surface. Lesions were covered by white, appressed mycelium that gradually assumed a grayish cast. The decay often extended to the pit.

Isolations were made from affected fruits and pure cultures of a fungus were readily obtained. Peach fruits were inoculated by needle puncture with pure cultures of this fungus and infections were evident 4 days later.

The growth of the fungus on potato-dextrose agar was at first white, became gray after 6 days, and after 2 weeks was black. After 21 days pycnidia were visible. Examination revealed the presence of pycnospores. The fungus was identified as a Diplodia.

No previous record of the natural occurrence of Diplodia on peach fruit has been found by the writers.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES, 5630 INGLESIDE AVENUE, CHICAGE 37

A CORRECTION

J. C. Carter writes that Noel B. Wysong, joint author of the note on oak wilt in the March 15 issue, page 173-174, is associated with the Forest Reserve District of Cook County, Illinois, so that the listing at the end of the article should read: ILLINOIS STATE NATURAL HISTORY SURVEY, URBANA, AND FOREST RESERVE DISTRICT OF COOK COUNTY, ILLINOIS

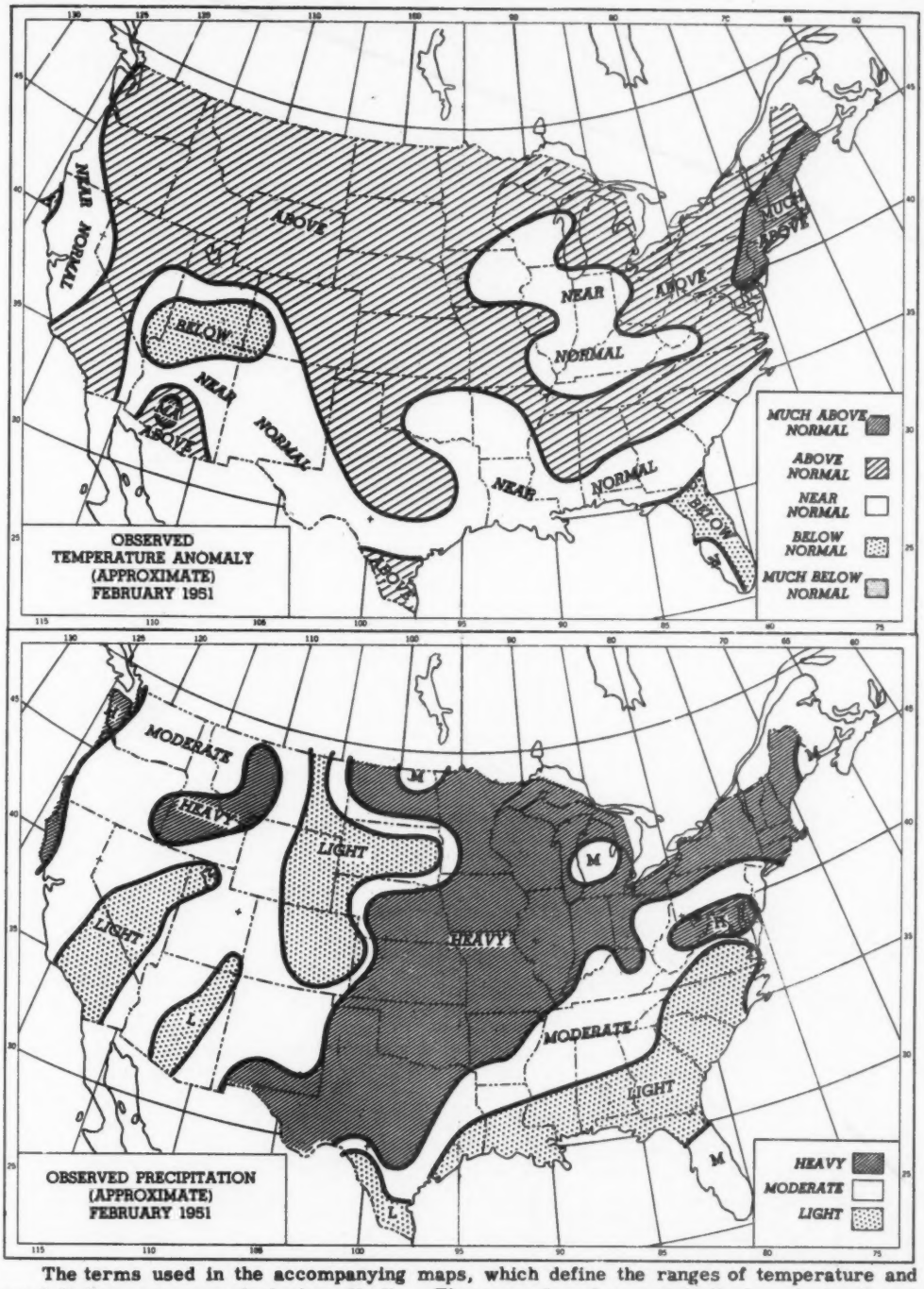
ATTENTION, PLEASE!

L. C. Callbeck writes:

"In the early morning hours of January 31 the Science Service building at Charlottetown, Prince Edward Island was totally destroyed by fire. Nothing was saved from the building. Our library contained many thousands of bulletins, reprints, etc. on phytopathological and related subjects and its loss is a serious blow to our work.

"We are faced with the chore of re-establishing a reference library for the new building whose plan is presently being studied."

Readers of the Reporter who wish to help in the replacement of this library should address correspondence to L. C. Callbeck, Laboratory of Plant Pathology, P. O. Box 220, Charlottetown, Prince Edward Island, Canada.



The terms used in the accompanying maps, which define the ranges of temperature and precipitation, are numerical class limits. These are based on a statistical analysis of past records through which is determined the normal frequency of occurrence of temperatures and precipitation at various times of the year for different locations. For temperature the classes above, below, and near normal are so defined that they each normally occur one-fourth of the time; much above and much below normal, one-eighth of the time. Precipitation is depicted in terms of light, moderate, and heavy, each class normally occurring one-third of the time and thereby having equal probability of occurrence. These maps graphically represent only the general trends and give the country's weather picture at a glance. For quantitative studies, where monthly mean temperatures and actual precipitation records are needed for a given time and place, other publications of the Weather Bureau should be consulted. P. R. M.

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